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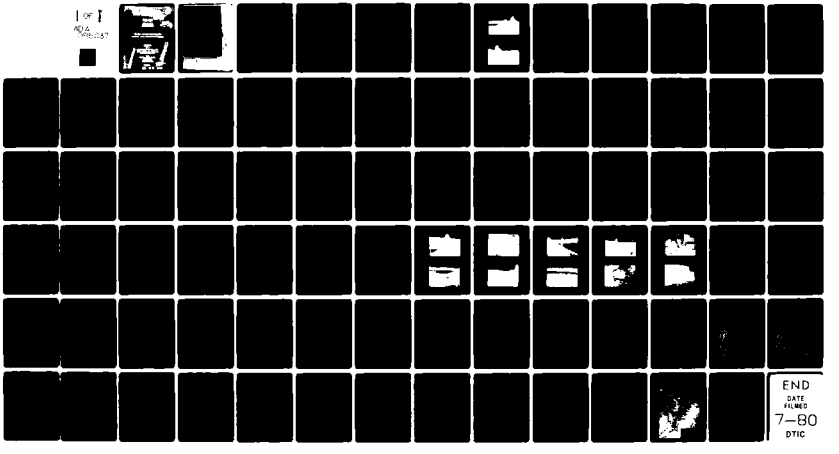

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MICHAEL BAKER, JR., INC.

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OHIO RIVER BASIN

NEAL DAM
WASHINGTON COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00494
PennDER No. 63-68

(6) ~~PHASE I INSPECTION REPORT~~
NATIONAL DAM INSPECTION PROGRAM.

Neal Dam (NDI Number PA-00494, PennDER Number 63-68), Ohio River Basin, Branch of Chartiers Creek, Washington County, Pennsylvania Phase II Inspection Report

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
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(11) Nov 80

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(10) John A. Dziubek

410795 slk

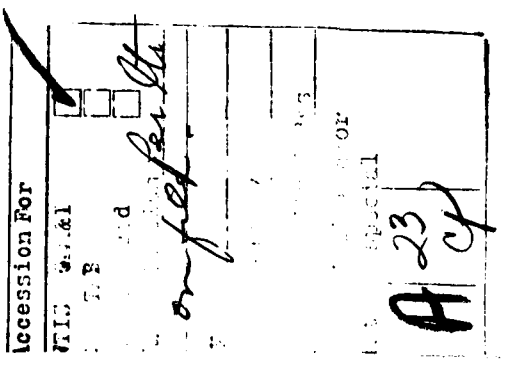
PREFACE

This report is prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Neal Dam, Washington County, Pennsylvania
NDI No. PA 00494, PennDER No. 63-68
Tributary of Chartiers Creek
Inspected 6 December 1979

ASSESSMENT OF GENERAL CONDITIONS

Neal Dam, owned and operated by Vernon C. Neal, is classified as a "Small" size - "Significant" hazard dam. The dam was found to be in good overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will pass the 100-year flood without overtopping the dam. A spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF) is required for Neal Dam. The 100-year flood was chosen because the dam is on the low side of the "Small" size category. The spillway is therefore considered "adequate."

Several minor items of remedial work should be performed by the owner as soon as practicable. These include:

1) Clean and seal the cracks in the spillway structure.

2) Repair the erosion around both sides of the end of the spillway structure and fill the voids under both sides of the end of the chute slab.

3) Raise the embankment/abutment on both sides of the spillway to a minimum Elevation of 1114.2 feet Mean Sea Level (M.S.L.) (top of the spillway walls). It is further recommended that the owner should raise these areas to the average top of dam (Elevati n 1115.5 feet M.S.L.).

4) Remove the trees and tree roots from the embankment and have the excavated area regraded and recompacted.

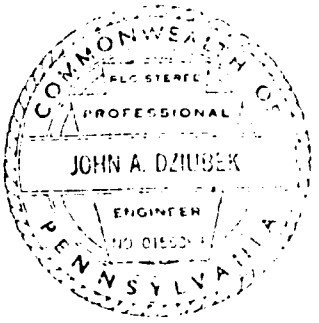
In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented. As a part of the formal inspection, the saturated condition of the downstream area of the embankment should be observed and the condition recorded. Also, the joints and cracks in the spillway should be observed and the separation recorded.



Submitted by:

MICHAEL BAKER, JR., INC.

John A. Dziubek

John A. Dziubek, P.E.
Engineering Manager-Geotechnical

Date: 25 March 1980

Approved by:

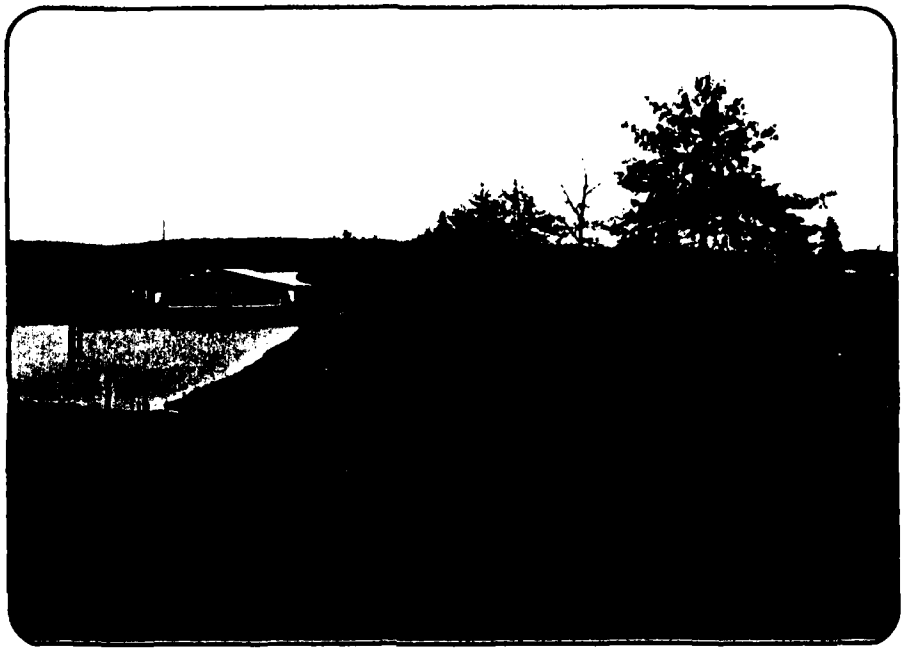
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

James W. Peck

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 29 April 1980

NEAL DAM



Overall View of the Upstream Slope and Crest of the Dam
from the Right Abutment

Overall View of the Downstream Slope of the Dam from the Right Abutment

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NEAL DAM
NDI No. PA 00494, PennDER No. 63-68

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - Neal Dam is an irrigation and recreation facility owned and operated by Mr. Vernon C. Neal. The dam is an earthfill embankment constructed primarily of clay and topsoil for the outer portion of the downstream slope. The dam has a maximum height of 25.6 feet and a crest length of 491 feet. The design drawings show a 12 foot wide clay cut-off trench extending two feet into underlying sandstone. The downstream slope is 5.5H:1V (Horizontal to Vertical) and the upstream slope is 3H:1V. The upstream slope is covered with riprap to within 2 feet of the crest of the dam.

The spillway, located at the right abutment of the dam, is 20 feet wide. The spillway structure extends 10 feet upstream of the location of the spillway crest. The spillway crest is at Elevation 1110.3 feet Mean Sea Level (M.S.L.) and consists of three courses of cinder block placed on the concrete channel slab to form a broad crested weir. The channel slab is at Elevation ±1108 feet M.S.L. and was originally designed to function as the normal pool level for the reservoir. The flow through the spillway after passing over the weir will travel approximately 76 feet downstream from the weir before turning to the left and passing over a 6 foot vertical drop. Additional drops of 6 feet and 3 feet are located an additional 30 and 55 feet downstream, respectively. The flow then discharges in a natural earth plunge pool.

The outlet works are located approximately 90 feet to the left of the spillway structure and consist of an 18 inch corrugated metal outlet pipe, a gate valve at the upstream end of the 18 inch corrugated metal pipe, and a junction box approximately 50 feet downstream of the toe of the embankment. An 8 inch V.C.P. carries the discharge from the junction box to the downstream channel.

b. Location - Neal Dam is located in South Franklin Township, Washington County, Pennsylvania, and is approximately 3200 feet southwest of Lagonda, Pennsylvania. The coordinates of the dam are N 40° 06.8', W 80° 17.6'. It can be found on Prosperity, Pennsylvania, USGS 7.5 minute topographic quadrangle.

c. Size Classification - The maximum height of the dam is 25.6 feet and the reservoir volume to the top of the dam is 156 acre-feet at Elevation 1115.5 feet M.S.L. Therefore, the dam is in the "Small" size category.

d. Hazard Classification - There are four secondary roads located below the dam that would be damaged in the event of a rapid discharge of the water behind the dam. In addition to the secondary roads, there are several homes located along Chartiers Creek in Lagonda, Pennsylvania that may suffer economic damage; however, loss of life is unlikely. Therefore, Neal Dam is considered in the "Significant" hazard category.

e. Ownership - The dam and reservoir are owned and operated by Mr. Vernon Neal, Lone Pine Ranch, Lagonda RD #6, Washington, Pennsylvania 15301.

f. Purpose of the Dam - The dam and reservoir are used for irrigation and fishing.

g. Design and Construction History - The dam was designed by Mr. Louis W. Reid, P.E. in 1957, and was built by Mr. Vernon Neal. The construction was started sometime in the fall of 1957 and was completed in December 1957.

h. Normal Operating Procedures - Normal pool Elevation is 1110.32 feet M.S.L. and is maintained by the weir on the spillway. However, the water level drops 5 to 6 feet by late summer due to the lake being used for irrigation purposes. Every fall

the lake is drawn down 3 to 4 feet below the crest of the weir.

1.3 PERTINENT DATA

a. Drainage Area (square miles) -	0.65
b. Discharge at Dam Site (c.f.s.) -	
Maximum Flood -	Unknown
Total Ungated Spillway Capacity (El. 1113.6 ft.) -	510
c. Elevation (feet above M.S.L.) -	
Design Top of Dam -	1116.0
Minimum Top of Dam -	1113.6
Average Top of Dam -	1115.5
Normal Pool (Crest of Weir) -	1110.3
Maximum Design Pool -	1114.0
Outlet Pipe -	
Invert at Entrance[1] -	1093
Invert at Exit -	1088.7
Streambed at Toe of Dam -	1088±
Maximum Tailwater -	Unknown
d. Reservoir (feet) -	
Length of Maximum Pool (El. 1115.5 ft.) -	1700
Length of Normal Pool (El. 1110.3 ft.) -	1650
e. Storage (acre-feet) -	
Top of Dam (El. 1115.5 ft.) -	156
Normal Pool (El. 1110.3 ft.) -	90
f. Reservoir Surface (acres) -	
Top of Dam (El. 1115.5 ft.) -	13.9
Normal Pool (El. 1110.3 ft.) -	10.5

[1]Estimated.

g. Dam -

Type -	Earthfill embankment
Length (feet)[2]-	491
Height (feet) - Design -	28.0
Field -	25.6
Top Width (feet) -	30
Side Slope - Upstream -	3H:1V
Downstream -	5.5H:1V

Zoning - The original embankment design (see Plate 3) called for a clay fill embankment to be constructed with 3H:1V upstream slope and 2H:1V downstream slope to El. 1114.0 ft. The remaining downstream embankment and two feet of fill on the embankment crest was to be constructed of compacted topsoil. The actual embankment was constructed with a 5.5H:1V downstream slope and, therefore, the actual zoning is not known.

Cut-off - A 12 foot minimum compacted clay cut-off trench is shown on the design plans (see Plate 3) extending approximately 2 feet into underlying sandstone or approximately 8.5 feet below original ground surface for most of the valley bottom.

Grout Curtain - None

Drains - According to the owner's representative, field drains were installed in the downstream toe area. However, the location or installation (design) of these drains was not recorded.

h. Diversion and Regulating Tunnel - None

i. Spillway -

Type -	Broad crested weir
Length of Crest Perpendicular to Flow (feet) -	20.0
Crest Elevation (feet M.S.L.) -	1110.3
Gates -	None

Upstream Channel - Currently, a 10 foot long approach channel (part of the spillway structure) is upstream from the spillway weir. Upstream of this section is the riprap-lined junction of the right abutment and dam embankment.

[2]Estimated from field survey. The design plans show the length of dam as 560 feet.

Downstream Channel - Downstream of the spillway weir the channel (spillway structure) continues straight in plan view for approximately 76 feet before angling to the left and passing over a 6 foot vertical drop. Approximately 30 feet downstream is another 6 foot vertical drop in the channel. An additional 25 feet downstream from the second step is the end of the spillway structure which has a 3 foot vertical drop. The spillway flow then discharges into a natural earth plunge pool.

j. Regulating Outlets - The outlet works consist of an 18 inch corrugated metal pipe with a gate valve at the upstream end. Downstream from the toe of the embankment the 18 inch corrugated metal pipe discharges into a junction box. The flow is then carried by an 8 inch V.C.P. to the downstream channel.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Neal Dam was designed by Louis W. Reid, P.E. and Arthur E. Tennyson, R.A. for Mr. Vernon C. Neal. The following information was reviewed for the inspection report:

1) The design drawings entitled, "Dam Over a Branch of Chartiers Creek" designed by Louis W. Reid, P.E. and Arthur E. Tennyson, R.A., dated 9 August 1957.

2) Letter to Mr. Vernon C. Neal from the Division of Dams and Encroachments outlining certain items of design that needed to be revised.

3) Revision of design drawings entitled, "Dam Over a Branch of Chartiers Creek" designed by Louis W. Reid, P.E. and Arthur E. Tennyson, R.A., dated 21 August 1957.

4) Application and Permit for Construction from the Pennsylvania Department of Environmental Resources (PennDER).

5) Construction progress reports made by Mr. Louis W. Reid, P.E., during construction of the dam.

6) A report by an Engineer of the Division of Dams and Encroachments, dated 21 September 1961.

7) Various photos and correspondence.

2.2 CONSTRUCTION

The construction of Neal Dam was completed by Mr. Vernon C. Neal's construction company. The construction was started sometime in the fall of 1957 and was completed in December 1957.

2.3 OPERATION

Normal pool Elevation is 1110.32 ft. M.S.L. and is maintained by the weir on the spillway. However, the water level drops 5 to 6 feet by late summer due to the lake being used for irrigation. Every fall the lake is drawn down 3 to 4 feet below the crest of the weir to protect the spillway structure from ice. A representative of the owner walks the embankment twice a week

during the summer and twice a month in the winter. The 18 inch gate valve is exercised once a year in the fall to drawdown the lake for the winter.

2.4 EVALUATION

a. Availability - The information reviewed consisted of the PennDER File No. 63-68 on the dam and information obtained from the owner's representative.

b. Adequacy - The information available is adequate for a Phase I Inspection.

c. Validity - There is no reason or indication at the present time to doubt the authenticity of the available engineering data. However, several changes to the design of the dam made during construction should be noted. These are:

1) The crest width of the embankment is 30 feet. The original design called for a 20 foot crest width.

2) The downstream slope is 5.5H:1V while the original design was 3H:1V.

3) The outlet pipe is 18 inches in diameter rather than the specified 12 inch diameter.

4) The spillway was revised from the original design drawings. See the field sketch in Appendix A for the "as built" plan view of the spillway.

5) The cut-off walls at the spillway were not constructed as designed. Only the two foot long left side cut-off wall was observed.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The visual inspection of Neal Dam was performed on 6 December 1979. The pool at the time of the inspection was at Elevation 1107.40 feet M.S.L. and no water was flowing over the weir. At the time of inspection, the dam and its appurtenances were considered to be in good condition. Noteworthy deficiencies observed during the inspections are described briefly in the following paragraphs. The visual inspection check list, field sketch, field sketch of the spillway, top of dam profile, and typical cross-section are given in Appendix A.

b. Dam - The embankment has a good cover of grass which is kept well cut. There are also several pin oaks planted along the downstream crest. No stability problems were discovered, but the soil along the downstream toe area was saturated. The owner's representative reported that this condition only exists during wet falls and wet springs and dries during the drier summer months.

c. Appurtenant Structures - The outlet works appeared to be in fair overall condition. It was found that the 12 inch steel pipe as shown on the construction drawings had been replaced with an 18 inch corrugated metal pipe during construction of the embankment.

The crest of the spillway has been raised by the owner to gain additional storage capacity. Three courses of cinder blocks were placed in the channel to raise the crest approximately 2.3 feet. Throughout this report the spillway crest cited is the weir created by these blocks.

The concrete training walls have several large cracks in them. A couple of construction and expansion joints have partially separated. Some of the concrete in the spillway is honeycombed.

The concrete chute had several large cracks in the slabs. At the bottom of the concrete chute it appeared that the soil from behind both training walls was eroded. On the right side this erosion extended 3 to 4 feet beneath the chute slab and on the right side the void under the chute slab extended 8 or 9 feet back.

d. Reservoir Area - No problems were observed in the reservoir area. The reservoir slopes are primarily moderately sloping pastures and farmlands. Approximately 1500 feet upstream of the reservoir there is a small dam.

e. Downstream Channel - Approximately 300 feet downstream of Neal Dam is a private road; 800 feet below the dam is the confluence of the downstream channel and Chartiers Creek. Below the confluence there are four small bridges which serve secondary roads. It is likely that these bridges would be damaged in the event of excessively rapid discharge. At approximately 3500 feet below the dam is the village of Lagonda. Several residential structures would suffer some economic damage but no loss of life would be expected in the event of a rapid discharge from Neal Dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Currently there are no formal written procedures in the event of impending failure of the dam. The condition of the dam is checked twice a week during warm weather and twice a month during the winter. The maintenance building for the golf course is located approximately 200 feet downstream on the right bank of the downstream channel. With this building being this close to the dam, it allows the golf course superintendent to make a quick visual inspection of the dam every day.

The 18 inch gate valve is opened each fall resulting in a drop of the water level 3 to 4 feet below the crest of the spillway.

It is recommended that formal emergency procedures be prepared, prominently displayed, and furnished to all operating personnel.

4.2 MAINTENANCE OF DAM

The maintenance condition of the dam is considered to be fair. There are no formal procedures for evaluating the necessity of maintenance for the dam; however, the golf course superintendent determines what work needs to be performed and schedules the work. It is recommended that formal maintenance procedures be developed and implemented.

4.3 MAINTENANCE OF OPERATING FACILITIES

The 18 inch gate valve is exercised only once a year in the fall to drawdown the lake level 3 to 4 feet below the crest of the weir. It is recommended that formal preventive maintenance schedules be established to assure continued operation.

4.4 WARNING SYSTEM

At the present time, there is no formal warning system or evacuation plan in operation.

4.5 EVALUATION OF OPERATING ADEQUACY

Maintenance of the operating facilities is considered adequate for the functions that they serve.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - PennDER files were reviewed for hydrologic and hydraulic design data. No hydrologic information was available in the files. They did contain one page showing that the maximum non-damaging discharge from the spillway was 772 c.f.s., based on the weir flow equation.

b. Experience Data - There was no information available on the maximum reservoir level or discharge.

c. Visual Observations - The low area on the crest of the dam adjacent to the spillway could have a minor effect on the hydraulic capability of the reservoir. No other conditions were observed at the time of the inspection that would indicate the dam and appurtenant structures could not operate satisfactorily in the event of a flood.

d. Overtopping Potential - Neal Dam is classified as a "Significant" hazard - "Small" size dam requiring evaluation for a spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF). Since the dam is on the low end of the small size category, the 100-year flood was chosen as the SDF. Using regression equations developed by the Pittsburgh District of the Corps of Engineers for the Ohio River Basin, the peak inflow to the impoundment for the 100-year flood was calculated to be 450 c.f.s. The spillway can safely pass a flow of 510 c.f.s. without overtopping. Because the peak inflow to the impoundment is less than the spillway capacity, the spillway of the dam is capable of passing the SDF without overtopping.

e. Spillway Adequacy - The dam, as outlined in the above analysis, is capable of passing the 100-year flood without overtopping. The spillway is therefore considered adequate according to the recommended criteria.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - No distress or seepage was observed on the embankment during the visual inspection. The saturated condition of the toe area of the embankment is not considered to be the result of steady state seepage through the embankment. In addition, the presence of this moisture does not indicate concern relative to the stability of the 5.5H:1V downstream slope. It is recommended that this area be periodically examined as a part of future inspections of the dam.

The cracks observed in the concrete of the spillway structure are not considered to adversely affect the structural stability of the spillway at this time. The opening of a couple of the construction joints in the spillway training walls is an undesirable condition; however, it is estimated that the stability of these walls is not in jeopardy at this time. It is recommended that cracks and joints be examined during the annual inspections and the amount of separation recorded.

b. Design and Construction Data - Design calculations were not available for review. Because of the low height of the dam, the moderate slopes and total width of the embankment, and because no signs of distress or steady state seepage was observed; no further stability analysis is deemed necessary for this Phase I Inspection Report.

c. Operating Records - Nothing in the operational information indicates concern relative to the structural stability of the dam.

d. Post-Construction Changes - The modification of the spillway by placing the additional 2.3 foot high cinder block wall in the channel decreases the amount of available flood storage in the reservoir and increases the possibility of overtopping the embankment; however, the spillway has been shown in Section 5 as capable of passing the recommended SDF. No other changes adversely affecting the structural stability of the dam have been performed.

e. Seismic Stability - The dam is located in Zone 1 on the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of minor seismic activity, and therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - Neal Dam was found to be in good overall condition at the time of inspection. Neal Dam is a "Significant" hazard - "Small" size dam requiring a spillway capacity in the range of the 100-year flood to 1/2 PMF. The 100-year flood was chosen as the SDF because the dam is on the low side of the "Small" size category. As presented in Section 5, the spillway and reservoir are adequate to pass the 100-year flood without overtopping the dam. Therefore, the spillway is considered "adequate."

The saturated condition at the toe of the embankment is considered to be the result of rainfall and not steady state seepage. This condition, at the present time, is not considered to adversely affect the structural stability of the embankment. However, this area should be observed in future inspections and the condition recorded.

Joint separations and cracks in the spillway structure are undesirable, but their condition should not affect the structural stability of the spillway at this time. It is recommended that the joints and cracks in the spillway be observed in future inspections and the condition and amount of separation recorded.

b. Adequacy of Information - The information available and the observations and measurements made during the field inspection are considered sufficient for this Phase I Inspection Report.

c. Urgency - The owner should initiate the action discussed in paragraph 7.2 as soon as practicable.

d. Necessity for Additional Data/Evaluation - No further investigation is necessary.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be performed by the owner. These include:

1) Clean and seal the cracks in the spillway structure.

2) Repair the erosion around both sides of the end of the spillway structure and fill the voids under both sides of the end of the chute slab.

3) Raise the embankment/abutment on both sides of the spillway to a minimum Elevation of 1114.2 feet M.S.L. (top of the spillway walls). It is further recommended that the owner should raise these areas to the average top of dam (Elevation 1115.5 feet M.S.L.).

4) Remove the trees and tree roots from the embankment and have the excavated area graded and recompacted.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock survillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented. As a part of the formal inspection, the saturated condition of the downstream area of the embankment should be observed and the condition recorded. Also, the joints and cracks in the spillway should be observed and the separation recorded.

APPENDIX A

VISUAL INSPECTION CHECK LIST, FIELD SKETCH, FIELD SKETCH OF THE SPILLWAY, TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION

Check List
Visual Inspection
Phase 1

Name of Dam Neal Dam County Washington (South Franklin Township) State PA Coordinates Lat. N 40°06.8' Long. W 80°17.6'

NDI # PA 00494
PennDER # 63-68

Date of Inspection 6 December 1979 Weather Overcast, cool Temperature 35° F.

Pool Elevation at Time of Inspection 1107.40 ft. M.S.L. Tailwater at Time of Inspection 992.10 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Uliniski
Jeff Maze
Jeff Quay

Owner's Representatives:

John McCellard, Superintendent

James G. Uliniski Recorder

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: NEAL DAM

NDI # PA 00494

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: NEAL DAM

NDI # PA 00494

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

EMBANKMENT

Name of Dam: NEAL DAM

NDI # PA 00494

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None, except at the end of the spillway structure (see page A-7).	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No problems observed	
RIPRAP FAILURES	None	

EMBANKMENT

Name of Dam: NEAL DAM
NDI # PA 00494

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
TREES	Pin oaks were observed on approximately 50 ft. spacings along the downstream edge of the crest of the embankment.	The trees and tree roots should be removed and the excavated area graded and recompacted.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems observed	
ANY NOTICEABLE SEEPAGE	Areas on both side of the outlet were wet and saturated (spongy). The owner's representative reported these areas are typically wet in the spring and fall and after heavy rain showers.	
STAFF GAGE AND RECORDER	None	
DRAINS	Field tile drains were installed in the downstream area; however, location and details of the installation were not recorded. The drains discharge into a small well reservoir located downstream.	

OUTLET WORKS

Name of Dam: NEAL DAM

NDI # PA 00494

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The outlet conduit (18 in. C.M.P.) at the junction box downstream was in reasonable condition. The rest of conduit could not be inspected.	
INTAKE STRUCTURE	The intake structure is submerged and could not be examined. The valve stem for the gate appeared slightly bent but is operational.	
OUTLET STRUCTURE	The outlet structure (junction box) was in reasonable condition. The 8 in. V.C.P. from the junction box discharges into the downstream channel.	
OUTLET CHANNEL	Not Applicable	
EMERGENCY GATE	The 18 in. gate valve is submerged and could not be examined. The gate valve is normally used every fall to lower the reservoir a few ft. to prevent ice action on the spillway structure.	

UNGATED SPILLWAY

Name of Dam: NEAL DAM
NDI # PA 00494

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The weir has been raised by 3 courses of blocks by the owner.	Masonry appeared in good condition.
APPROACH CHANNEL	No problems observed	
DISCHARGE CHANNEL	The discharge channel is in good condition except for cracks in the concrete floor and walls.	Clean out and seal cracks.
BRIDGE AND PIERS	None	

GATED SPILLWAY - Not Applicable

Name of Dam: NEAL DAM
NDI # PA 00494

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION - None

Name of Dam: NEAL DAM
NDI # PA 00494

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

RESERVOIR

Name of Dam: NEAL DAM

NDI # PA 00494

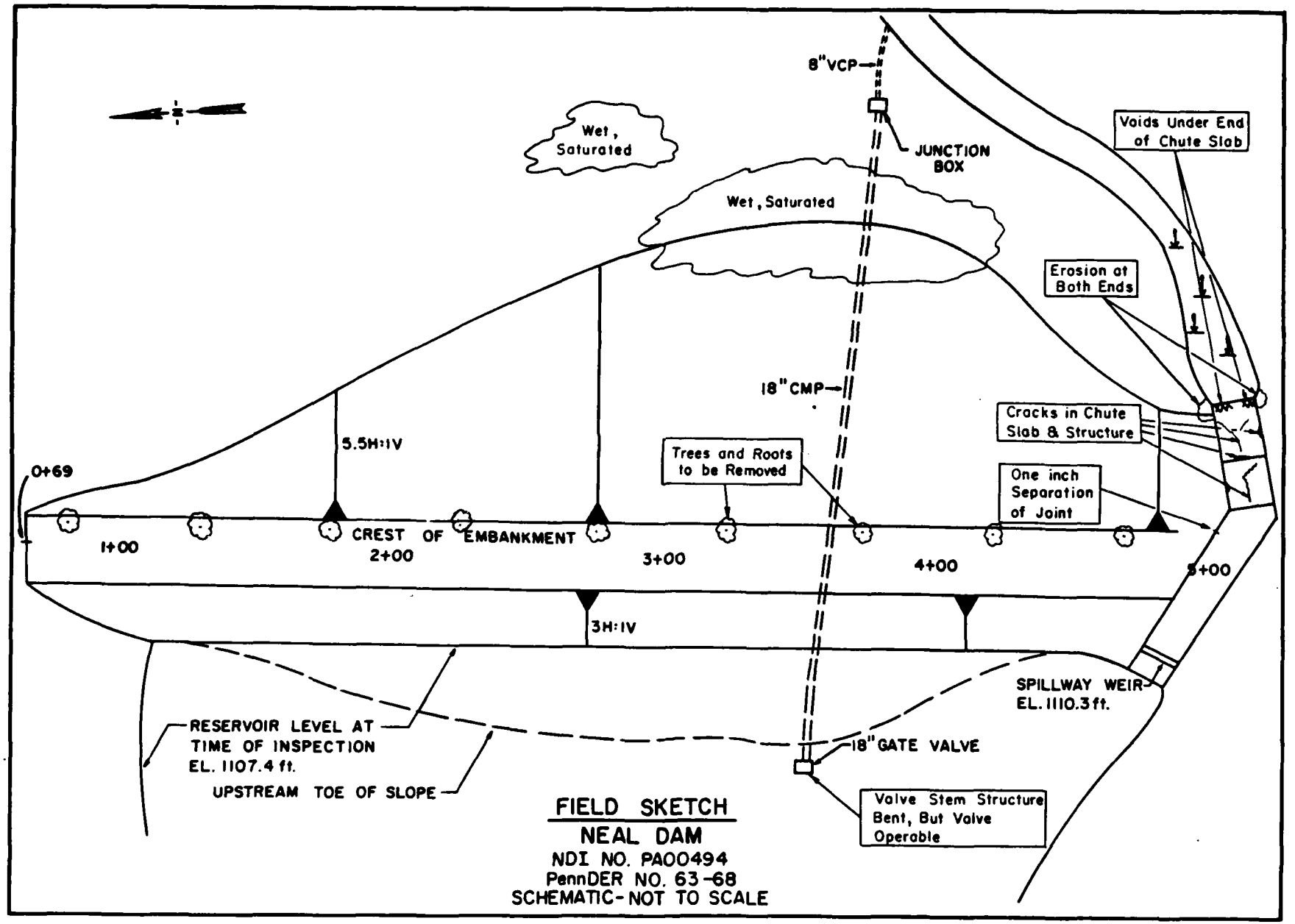
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoir slopes are mildly sloping. No problems were observed.	
SEDIMENTATION	Sediment in the deepest spot (near the outlet works) is approximately 15 to 18 in. Some sedimentation has occurred on the upper end of the reservoir.	

DOWNSTREAM CHANNEL

Name of Dam: NEAL DAM

NDI # PA 00494

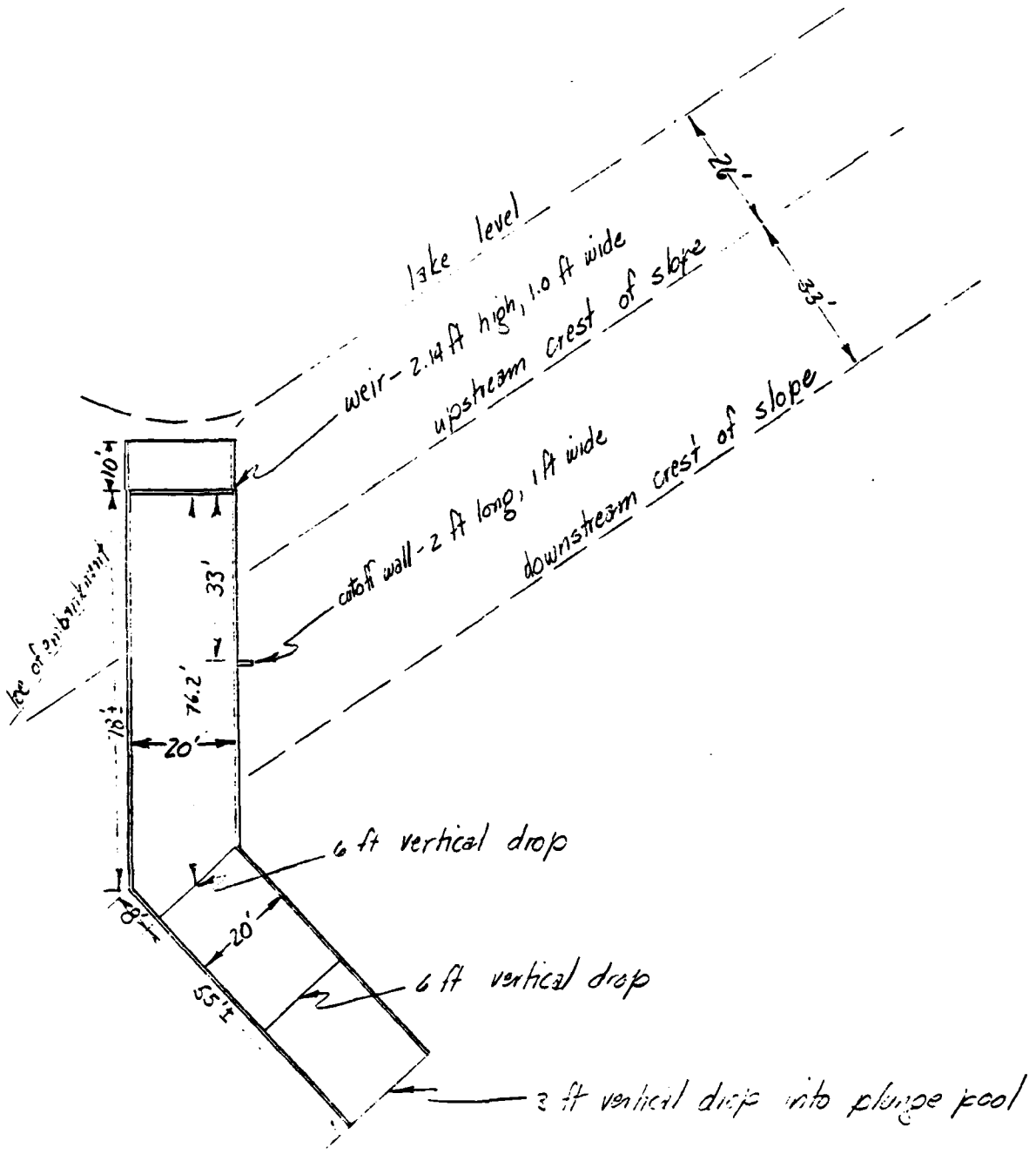
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel has a few cattails growing in it immediately downstream from the discharge channel. The remainder of the channel is clear of any type of debris.	
SLOPES	The channel slope is approximately 2.5% from the toe of the dam to the confluence with Chartiers Creek. The channel side slopes are mild and no problems were observed.	
APPROXIMATE NO. OF HOMES AND POPULATION	The golf course maintenance building is built higher than the channel on fill and probably would not suffer any damage. An access road to the maintenance building crosses the channel approximately 300 ft. downstream from the dam. The culvert is a 48 in. diameter C.M.P. Approximately 800 ft. downstream is the confluence with Chartiers Creek. 250 ft. from the confluence downstream is the access road to the golf course and dam. Located 2700 ft. and 3500 ft. downstream from the confluence are two township road bridges. Several homes between the two bridges and downstream from the last bridge are located within the floodplain of Chariers Creek and may suffer economic damage in the event of a dam failure or heavy discharges from the dam.	



FIELD SKETCH
NEAL DAM
NDI NO. PA00494
PennDER NO. 63-68
SCHEMATIC- NOT TO SCALE

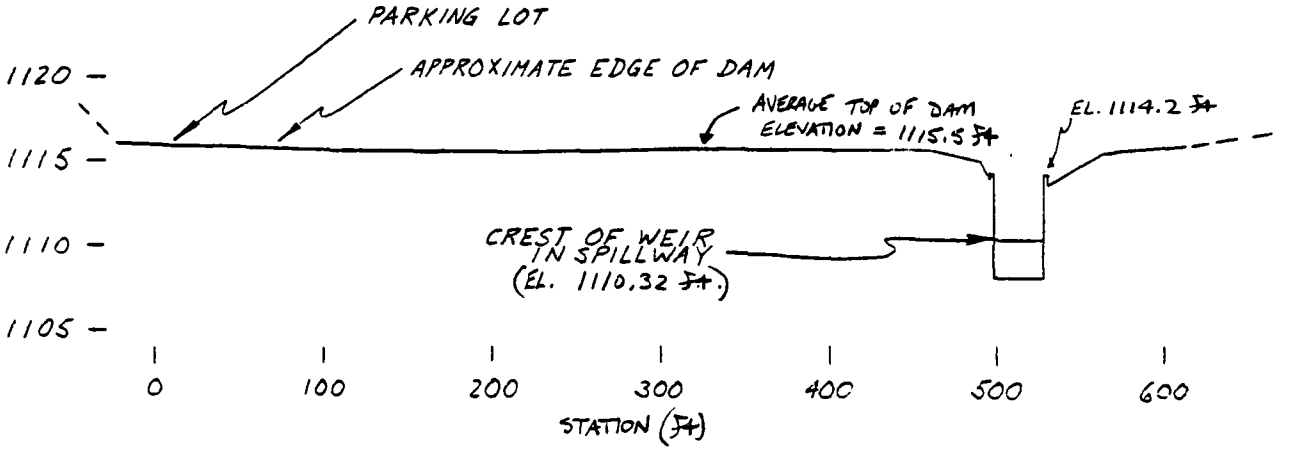
NEAL DAM

FIELD SKETCH OF THE SPILLWAY

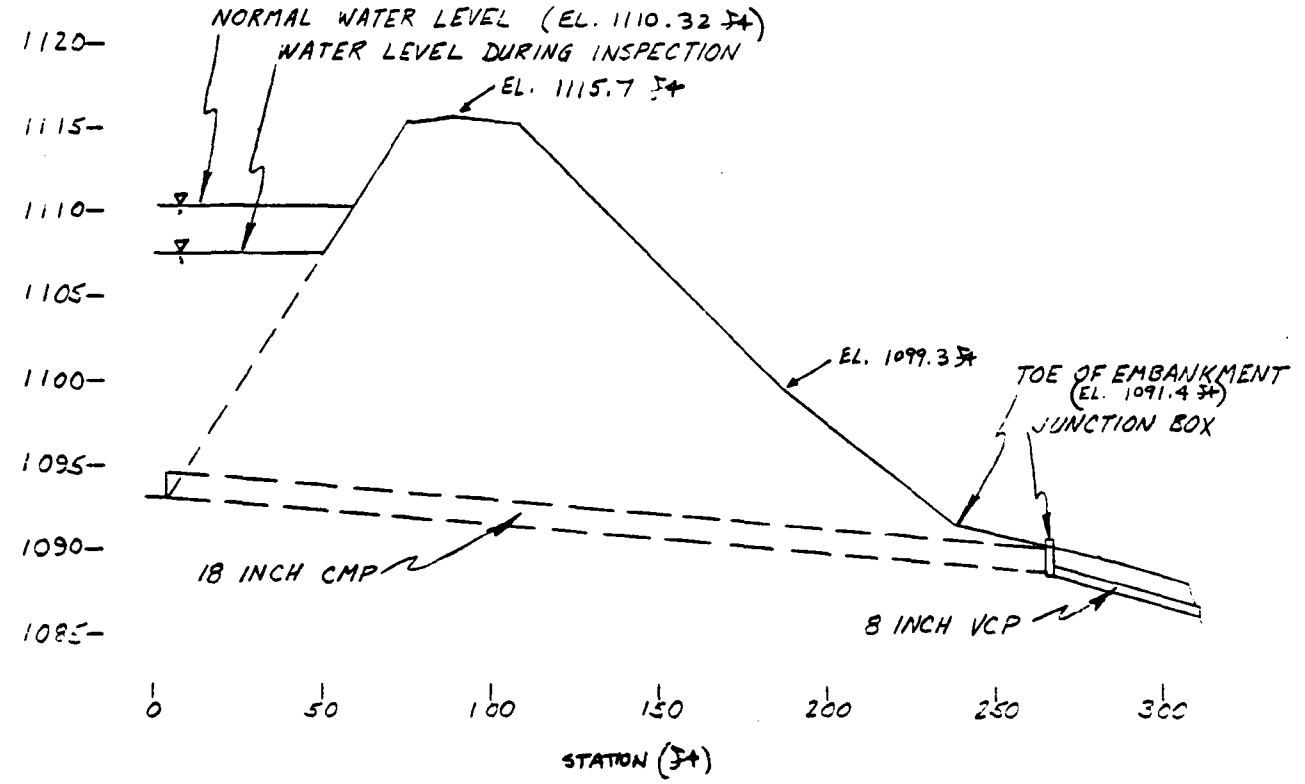


TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

TOP OF DAM PROFILE (LOOKING DOWNSTREAM):



CROSS SECTION: (AT STATION 2+00)



APPENDIX B

ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: NEAL DAM
NDI # PA 00494

ITEM	REMARKS
PLAN OF DAM	The original design drawing showing the plan of dam has been reproduced and included in this report as Plate 3.
REGIONAL VICINITY MAP	A USGS 7.5 minute topographic quadrangle, Prosperity, Pennsylvania, was used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	The dam was designed by Mr. Louis W. Reid, P.E. and was constructed by Mr. Vernon C. Neal. The construction started in the fall of 1957 and was completed in December of 1957.
TYPICAL SECTIONS OF DAM	An original design drawing cross-section is shown on Plate 3 of this report. A typical cross-section, measured during the visual inspection, is included in Appendix A.
HYDROLOGIC/HYDRAULIC DATA	No information available
OUTLETS - PLAN and DETAILS	See Plate 3 of this report.
- CONSTRAINTS	None
- DISCHARGE RATINGS	No information available
RAINFALL/RESERVOIR RECORDS	Rainfall records are kept by the superintendent of maintenance of the golf course. Reservoir records are not kept.

Name of Dam: NEAL DAM

NDI # PA 00494

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	No information was available. The regional geology is included in this report as Appendix F.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Four test pits were dug along the centerline axis of the dam. The location and results of these test pits are shown on Plate 4 of this report.
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	According to the owner's representative, the borrow for the dam came from the left abutment hillside.

Name of Dam: NEAL DAM

NDI # PA 00494

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	The crest of the spillway was raised 3 ft. with a cinder block wall. A gasline was installed crossing the downstream slope from the right downstream toe to the left crest of the slope. The gasline was placed 2 ft. below grade.
HIGH POOL RECORDS	No information available
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*An inspection report by a representative of PennDER on 25* September 1961. This report is available in the PennDER file.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	Formal maintenance and operation records are not kept. Mr. McCelland walks the embankment approximately twice a week in the summer and approximately twice a month in the winter. The maintenance building for the golf course is located on the right hillside below the dam and people are usually there year round, therefore, any unusual occurrence at the dam would probably be observed.

Name of Dam: NEAL DAM
NDI # PA 00494

ITEM	REMARKS
SPILLWAY PLAN, SECTIONS, and DETAILS	See Plates 3 and 4 of this report.
OPERATING EQUIPMENT PLANS & DETAILS	No details available

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.65 sq.mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1110.ft. (90 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1115.5 ft. (156 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1114.0 ft.

ELEVATION TOP DAM: 1113.6 ft. (minimum), 1115.5 ft. (average)

CREST: Spillway

a. **Elevation** 1110.32 ft.
b. **Type** Sharp-crested concrete weir in rectangular concrete channel
c. **Width of Crest Parallel to Flow** 1 ft.
d. **Length of Crest Perpendicular to Flow** 20 ft.
e. **Location Spillover** At right abutment of dam
f. **Number and Type of Gates** None

OUTLET WORKS: Facilities for dewatering reservoir

a. **Type** 18 in. dia. C.M.P. feeding into 8 in. dia. V.C.P.
b. **Location** Near centerline of embankment
c. **Entrance inverts** El. 1093 ft. (estimated)
d. **Exit inverts** El. 1088.7 ft. (18 in. C.M.P.), El. 1087.4 ft. (8 in. V.C.P.)
e. **Emergency draindown facilities** Gate valve at upstream end of 18 in. C.M.P.

HYDROMETEOROLOGICAL GAGES: None installed

a. **Type**
b. **Location**
c. **Records**

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View of Dam

Top Photo (OV-T) - Overall View of the Upstream Slope and Crest of the Dam from the Right Abutment

Bottom Photo (OV-B) - Overall View of the Downstream Slope of the Dam from the Right Abutment

Photograph Location Plan

Photo 1 - View of the Approach to the Spillway

Photo 2 - View Looking Upstream at the Crest of the Spillway

Photo 3 - View Looking Downstream at Spillway Discharge Channel

Photo 4 - View Looking Upstream at Spillway Discharge Channel

Photo 5 - View of the Riprap and Crest of the Embankment from the Left Abutment

Photo 6 - View of the Valve Stem and Structure for the Outlet Conduit

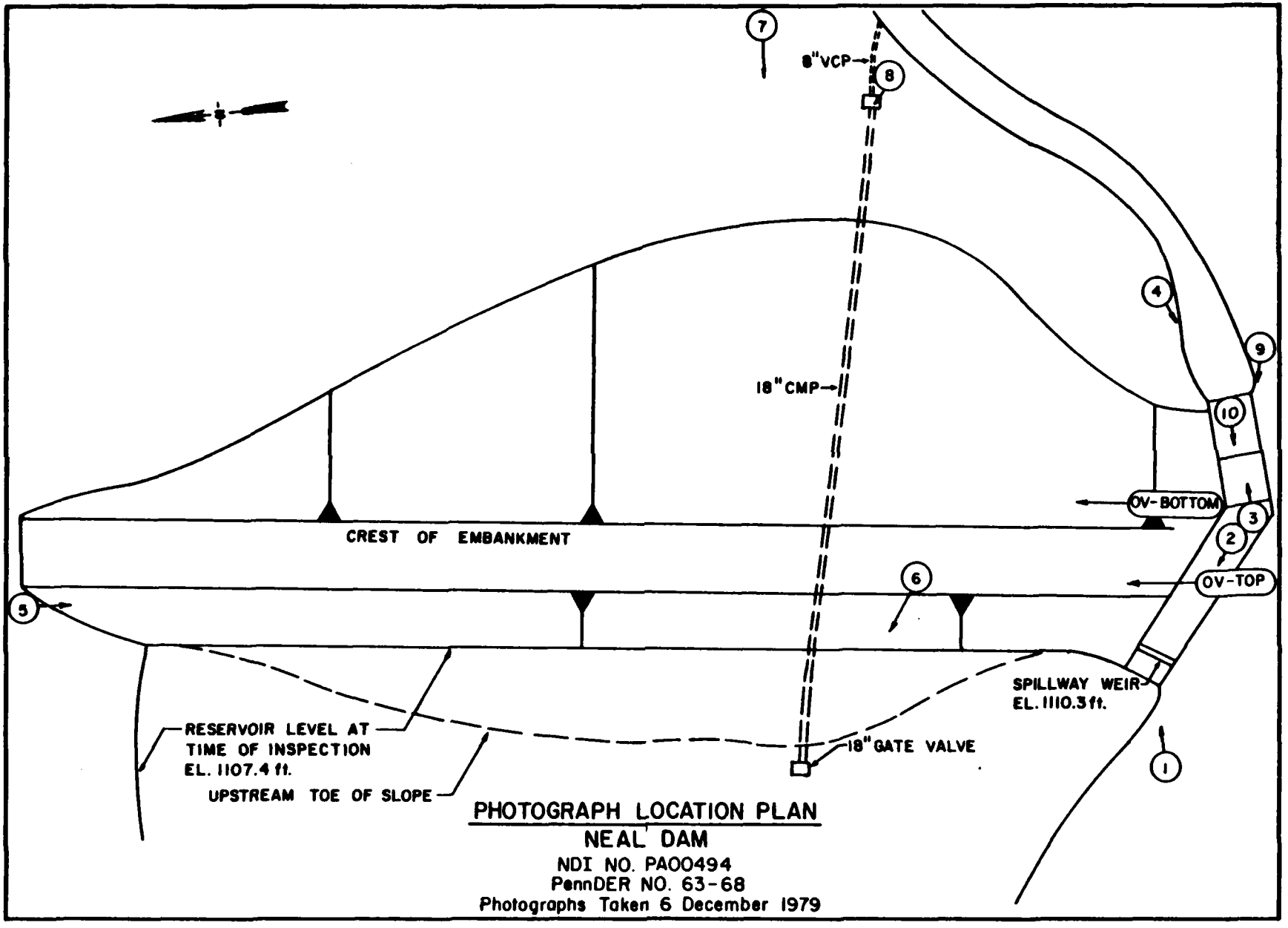
Photo 7 - View Looking Upstream at the Downstream Slope

Photo 8 - Close-up View of the Discharge End of the Outlet Conduit

Photo 9 - Close-up View of the Erosion at the Right End of the Spillway Structure

Photo 10 - Close-up View of Several of the Cracks in the Spillway structure

Note: Photographs were taken on 6 December 1979.



PHOTOGRAPH LOCATION PLAN

NEAL DAM

NDI NO. PA00494

PennDER NO. 63-68

Photographs Taken 6 December 1979

NEAL DAM

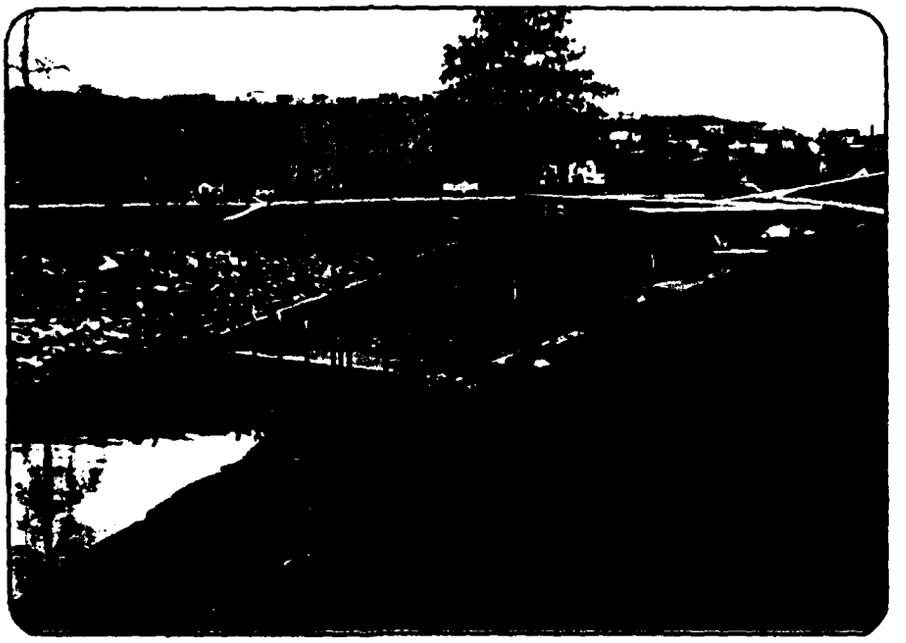


PHOTO 1. View of the Approach to the Spillway

PHOTO 2. View Looking Upstream at the Crest of the Spillway

PHOTO 3. View Looking Downstream at Spillway Discharge Channel

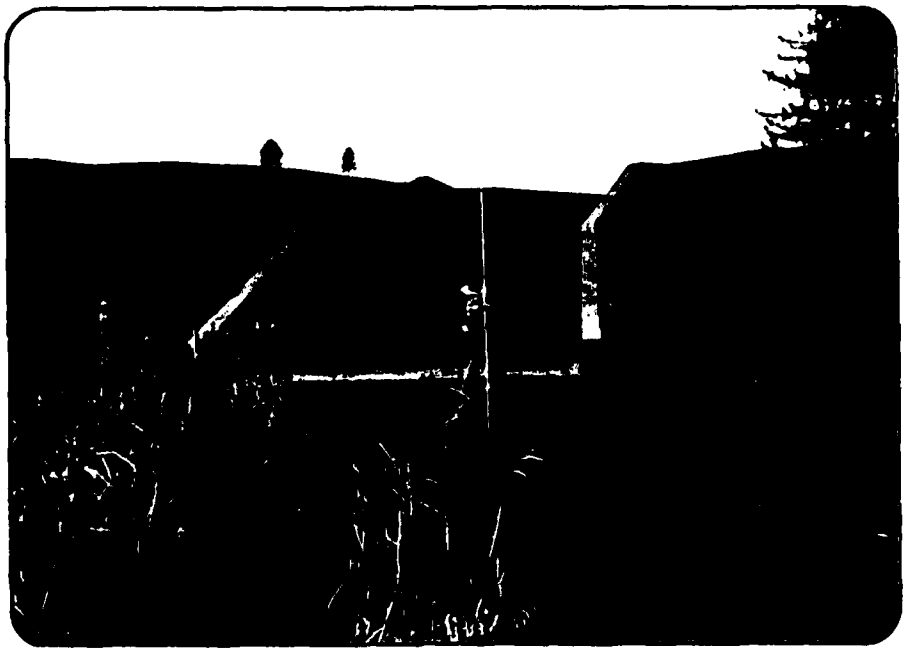


PHOTO 4. View Looking Upstream at Spillway Discharge Channel

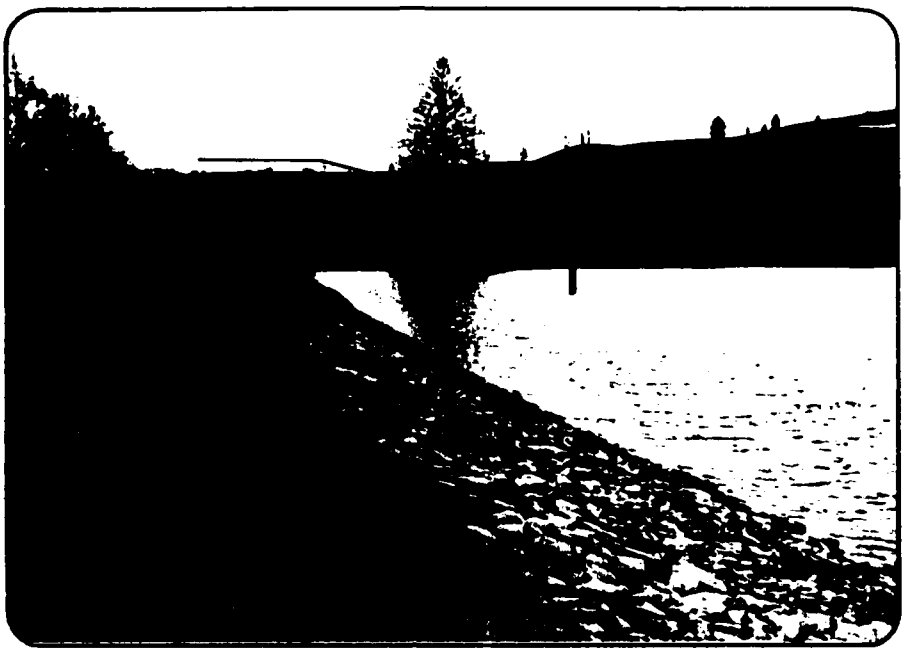


PHOTO 5. View of the Riprap and Crest of the Embankment from the Left Abutment

PHOTO 6. View of the Valve Stem and Structure for the Outlet Conduit

PHOTO 7. View Looking Upstream at the Downstream Slope

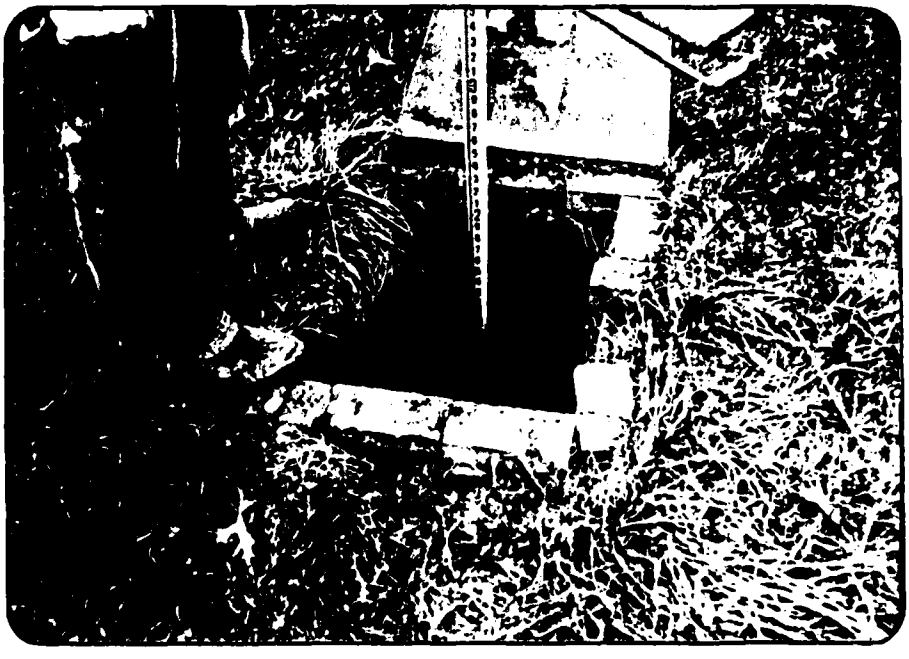


PHOTO 8. Close-up View of the Discharge End of the Outlet Conduit

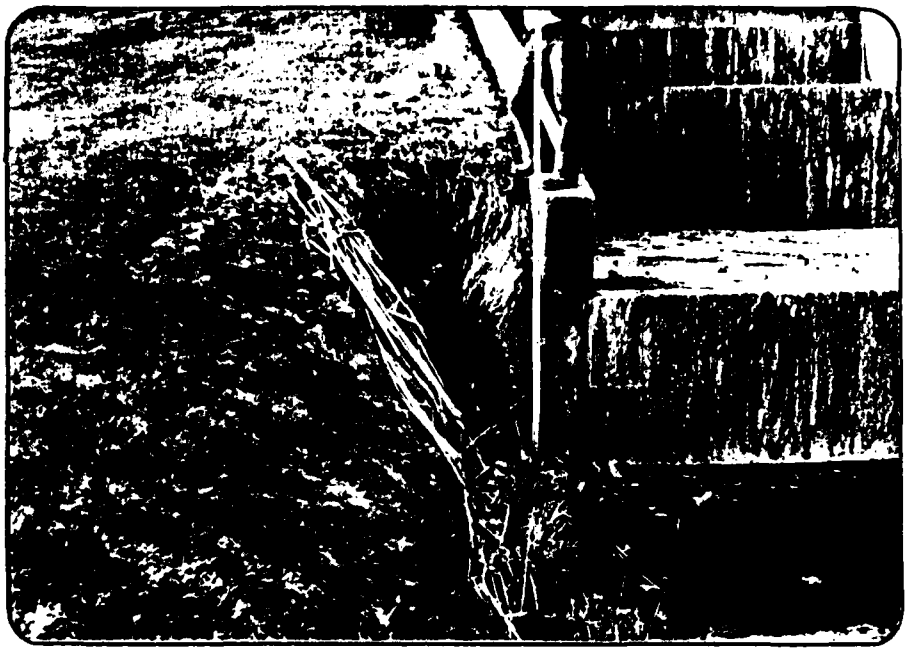


PHOTO 9. Close-up View of the Erosion at the Right End of the Spillway Structure

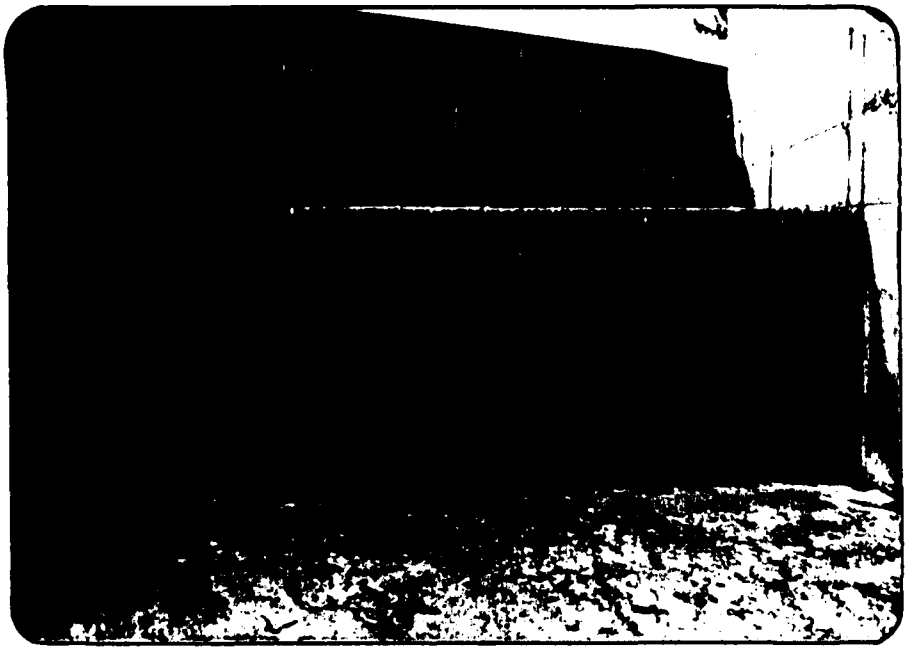


PHOTO 10. Close-up View of Several of the Cracks in the Spillway Structure

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject NEAL DAM S.O. No.
APPENDIX D - HYDROLOGIC AND Sheet No. of
HYDRAULIC COMPUTATIONS Drawing No.
Computed by Checked by Date

TABLE OF CONTENTS

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The hydrologic determinations presented in this Phase I Inspection Report are based on the use of a Snyder's unit hydrograph developed by the U.S. Army Corps of Engineers. Due to the limited number of gaging stations available in this hydrologic region and the wide variations of watershed slopes, the Snyder's coefficients may yield results of limited accuracy for this watershed. As directed however, a further refinement of these coefficients is beyond the scope of this Phase I Investigation.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: NEAL DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 24.2 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	NEAL DAM				
Drainage Area (square miles)	0.65				
Cumulative Drainage Area (square miles)	0.65				
Adjustment of PMF for Drainage Area (%)[2]	Zone 7				
6 Hours	102				
12 Hours	120				
24 Hours	130				
48 Hours	140				
72 Hours	--				
Snyder Hydrograph Parameters					
Zone [3]	28				
C_p/C_t [4]	0.57/1.7				
L (miles) [5]	1.16				
L_{ca} (miles)[5]	0.57				
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (hours)	1.5				
Spillway Data					
Crest Length (ft)	20				
Freeboard (ft)	6				
Discharge Coefficient	3.09				
Exponent	1.5				

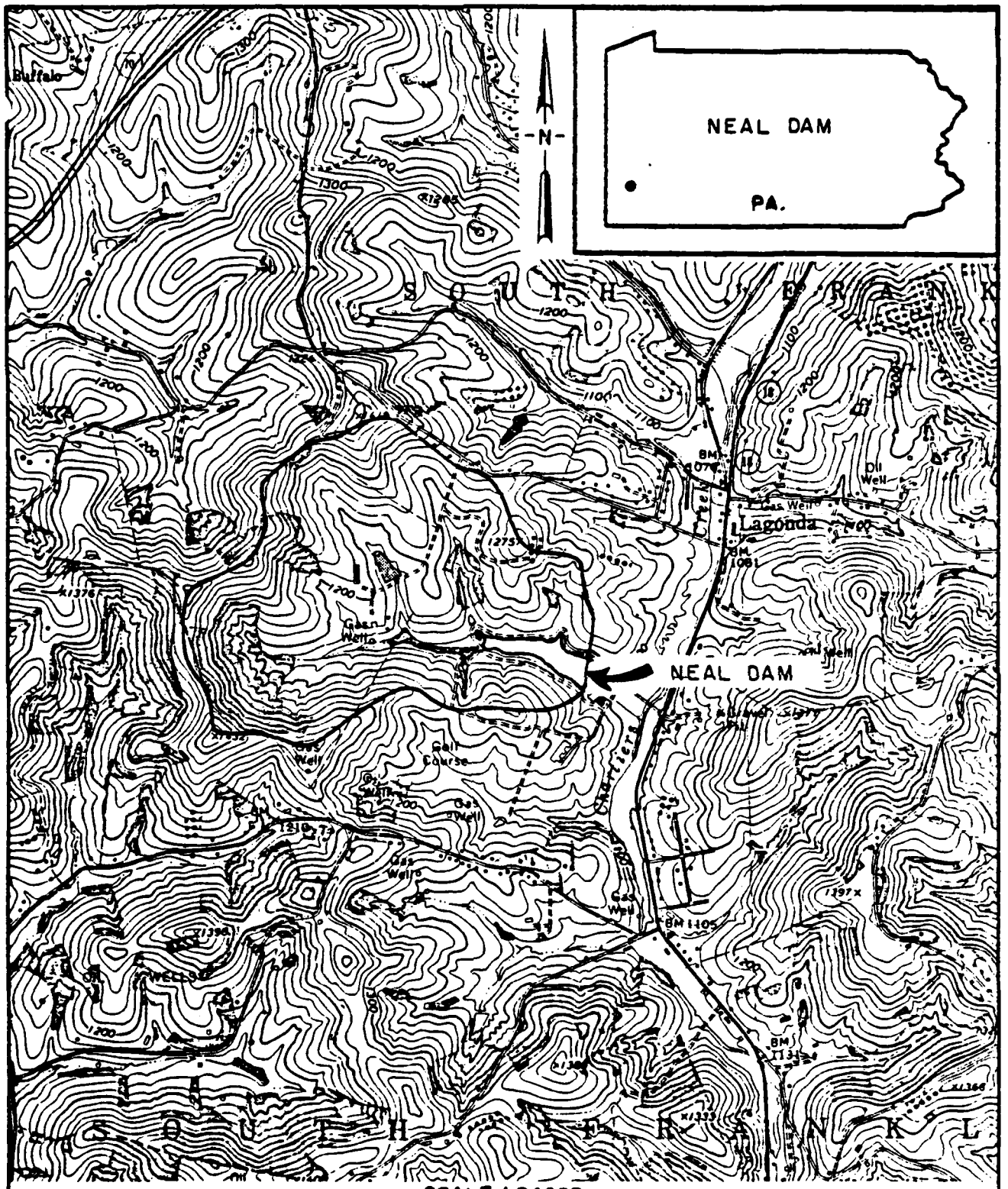
[1] Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

[2] Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

[3] Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

[4] Snyder's Coefficients.

[5] L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.



NEAL DAM
DRAINAGE AREA MAP

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
Box 280
Beaver, Pa. 15009

Subject NEAL DAM — S.O. No.
STORAGE INFORMATION AND — Sheet No. 3 of 9
100 YEAR FLOW CALCULATION — Drawing No.
Computed by WDL — Checked by — Date 3-21-80

STORAGE INFORMATION:

SURFACE AREA VS. ELEVATION DATA:

ELEVATION, Ft	SURFACE AREA, ACRES
1093.0	0.0 (ESTIMATED)
1095.0	2.4 (MEASURED ON TOPOGRAPHIC SURVEY, PLATE 5)
1100.0	4.7 " " " " " "
1108.0	9.2 " " " " " "
1120.0	17.1 (MEASURED ON PROSPERITY, PA. QUAD)
1140.0	39.5 " " " " "

100-YEAR FLOOD FLOW CALCULATION:

USING ANALYSIS PERFORMED BY THE PITTSBURGH DISTRICT, COE, FOR THE OHIO RIVER BASIN, THE PEAK INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD IS:

$$Q_{100} = 120.38 (D.A. \times S^{1/2})^{0.744099}$$

D.A. = DRAINAGE AREA = 0.65 mi²

S = CHANNEL SLOPE OF THE LOWER 0.7 OF THE WATERSHED

S = 82.6 Ft/mi

$$Q_{100} = 120.38 ([0.65][82.6]^{1/2})^{0.744099}$$

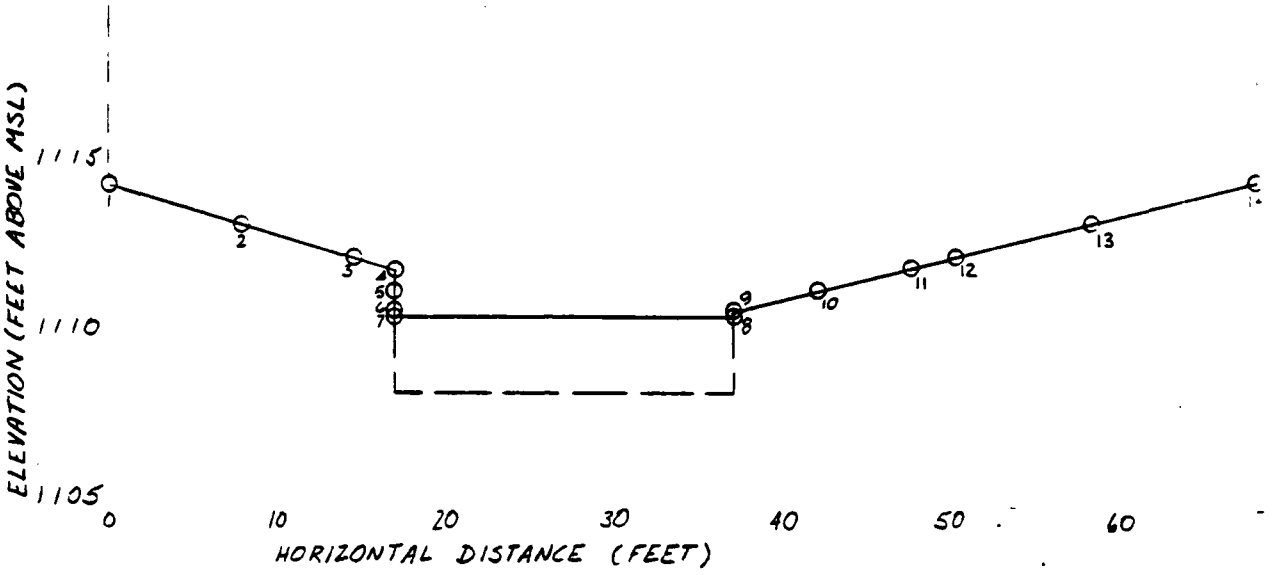
$Q_{100} = 451.4$ cfs — Say $Q_{100} = 450$ cfs

THE SPILLWAY CAN SAFELY PASS 510 cfs (ELEV. 1113.6 Ft) WITHOUT OVERTOPPING. SINCE THE PEAK INFLOW TO THE IMPOUNDMENT IS LESS THAN THE SPILLWAY CAPACITY, THE DAM CAN SAFELY PASS THE SDF WITHOUT OVERTOPPING.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Neal Dam — S.O. No. 13547-20-ABA-20
Emergency Spillway - Rating Table at Weir — Sheet No. 4 of 9
Drawing No. ____
Computed by JAQ — Checked by WLS — Date Feb 4, 1980



POINT	STATION	ELEVATION
1	0'	1114.2'
2	7.9'	1113.0'
3	14.5'	1112.0'
4	17.0'	1111.58'
5	17.0'	1111.0'
6	17.0'	1110.44'
7	17.0'	1110.32'
8	37.0'	1110.32'
9	37.0'	1110.44'
10	42.0'	1111.0'
11	47.6'	1111.58'
12	50.2'	1112.0'
13	58.3'	1113.0'
14	68.0'	1114.2'

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Subject NEAL DAM — S.O. No. 13547-00-ARA-20
EMERGENCY SPILLWAY - RATING — Sheet No. 5 of 9
TABLE AT WEIR — Drawing No. ____
Computed by JAQ — Checked by WLS — Date 4 FEB 80

The rating table was developed assuming critical depth at the weir (control section). The equations used are from Chow's Open-Channel Hydraulics:

$D = \frac{A}{T}$ (Equation 2-2, page 23)
$V = \sqrt{gD}$ (Equation 1-11, page 13)
$Q = VA$ (Equation 1-1, page 5)
$H_v = \frac{V^2}{2g}$ (page 3)
E.G. = W.S. + H_v (Figure 1-1, page 4)

where:
D = hydraulic depth
A = cross section area
T = topwidth
g = acceleration due to gravity, 32.2 feet per second^2
Q = discharge
H_v = velocity head
E.G. = energy grade elevation
W.S. = water surface elevation

Upstream Water Surface Elev. (feet, MSL)	Topwidth (feet)	Area (feet^2)	Depth (feet)	Velocity (fps)	Discharge (cfs)	Velocity head (feet)	E.G. Elev (feet, MSL)
1110.32	20	0	0	0	0	0	1110.32
1110.44	20	2.4	.12	1.97	4.7	.06	1110.50
1111.0	25	15.0	.60	4.40	66.0	.30	1111.30
1111.58	30.6	31.1	1.02	5.72	177.9	.51	1112.09
1112.0	35.7	45.0	1.26	6.37	286.6	.63	1112.63
1113.0	50.4	88.1	1.75	7.50	660.8	.87	1113.87
1114.2	68.0	159.1	2.34	8.68	1381	1.17	1115.37
1115.0	68.0	213.5	3.14	10.0	2135	1.55	1116.55
1116.0	68.0	281.5	4.14	11.6	3265	2.09	1118.09
1117.0	68.0	349.5	5.14	12.9	4509	2.58	1119.58
1118.0	68.0	417.5	6.14	14.1	5867	3.09	1121.09

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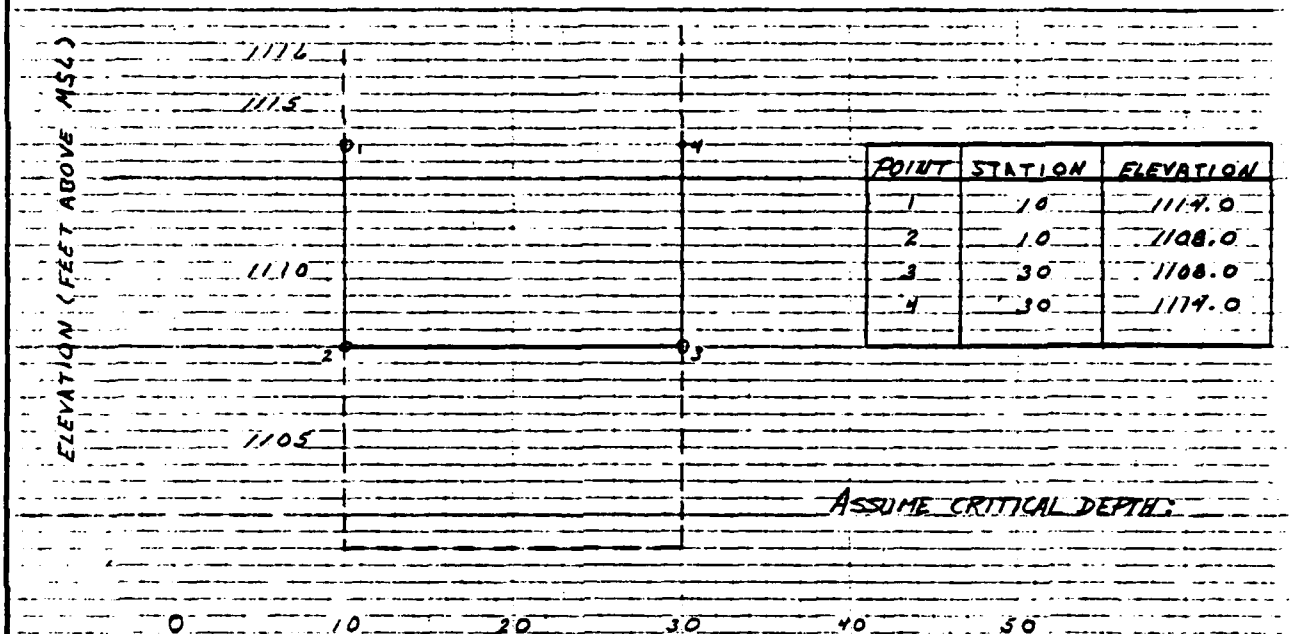
Beaver, Pa. 15009

Subject Neal Dam — S.O. No. 13547-00-ARA-20
Emergency Spillway - Rating — Sheet No. 6 of 9
Table at First 1-ft. Drop — Drawing No.
Computed by ALB — Checked by JAQ — Date 02/20/80



POINT	STATION	ELEVATION
1	10	1114.0
2	10	1108.0
3	30	1108.0
4	30	1114.0

ASSUME CRITICAL DEPTH:

$D = A/T$ $V = \sqrt{g \cdot D}$ $Q = VA$ $H_v = \frac{V^2}{2g}$ $EG = WS + H_v$

Upstream Water Surface Elev. (feet, MSL)	Topwidth (feet)	Area (feet²)	Depth (feet)	Velocity (fps)	Discharge (cfs)	Velocity Head	E.G. Elev. (ft. msl)
1108.0	20	0	0 ✓	0 ✓	0 ✓	0 ✓	1108.0 ✓
1109.0	20	20	1 ✓	5.67 ✓	113.4 ✓	0.50 ✓	1109.5 ✓
1110.0	20	40	2 ✓	8.02 ✓	320.8 ✓	1.00 ✓	1111.0 ✓
1111.0	20	60	3 ✓	9.83 ✓	589.8 ✓	1.50 ✓	1112.5 ✓
1112.0	20	80	4 ✓	11.35 ✓	908.0 ✓	2.00 ✓	1114.0 ✓
1113.0	20	100	5 ✓	12.69 ✓	1269.0 ✓	2.50 ✓	1115.5 ✓
1114.0	20	120	6 ✓	13.90 ✓	1668.0 ✓	3.00 ✓	1117.0 ✓
1114.2	20	124	6.2 ✓	14.13 ✓	1752.1 ✓	3.10 ✓	1117.3 ✓
1115.0	20	140	7 ✓	15.01 ✓	2101.4 ✓	3.50 ✓	1118.5 ✓
1116.0	20	160	8 ✓	16.05 ✓	2568.0 ✓	4.00 ✓	1120.0 ✓
1117.0	20	180	9 ✓	17.02 ✓	3063.6 ✓	4.50 ✓	1121.5 ✓

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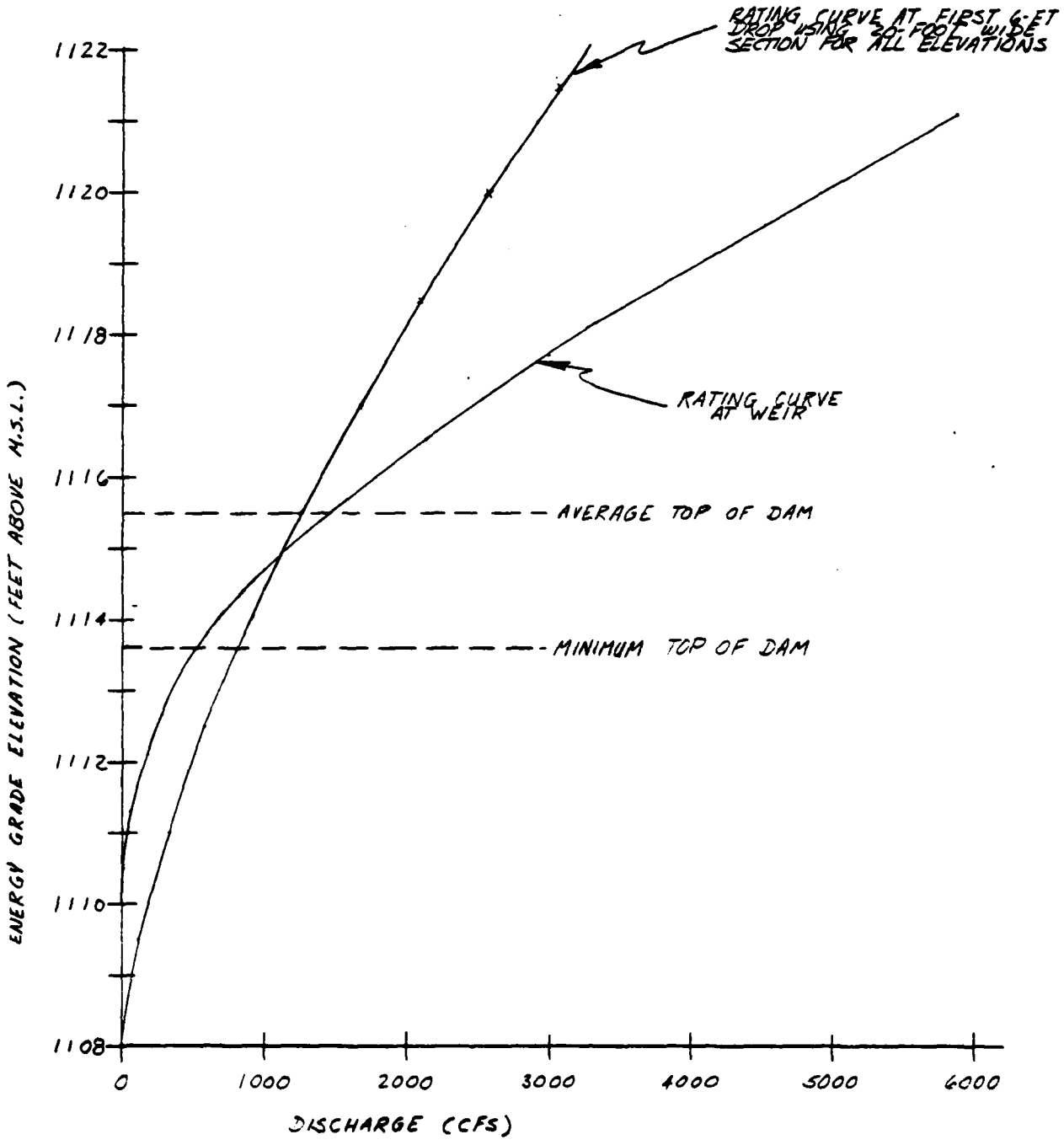
Box 280
Beaver, Pa. 15009

Subject Neal Dam
Emergency Spillway
Rating Curve

S.O. No. 13547-00-ARA-20
Sheet No. 7 of 9
Drawing No.

Computed by JAQ Checked by Date Feb 4, 1980

ENERGY GRADIENT ELEVATION VS. DISCHARGE



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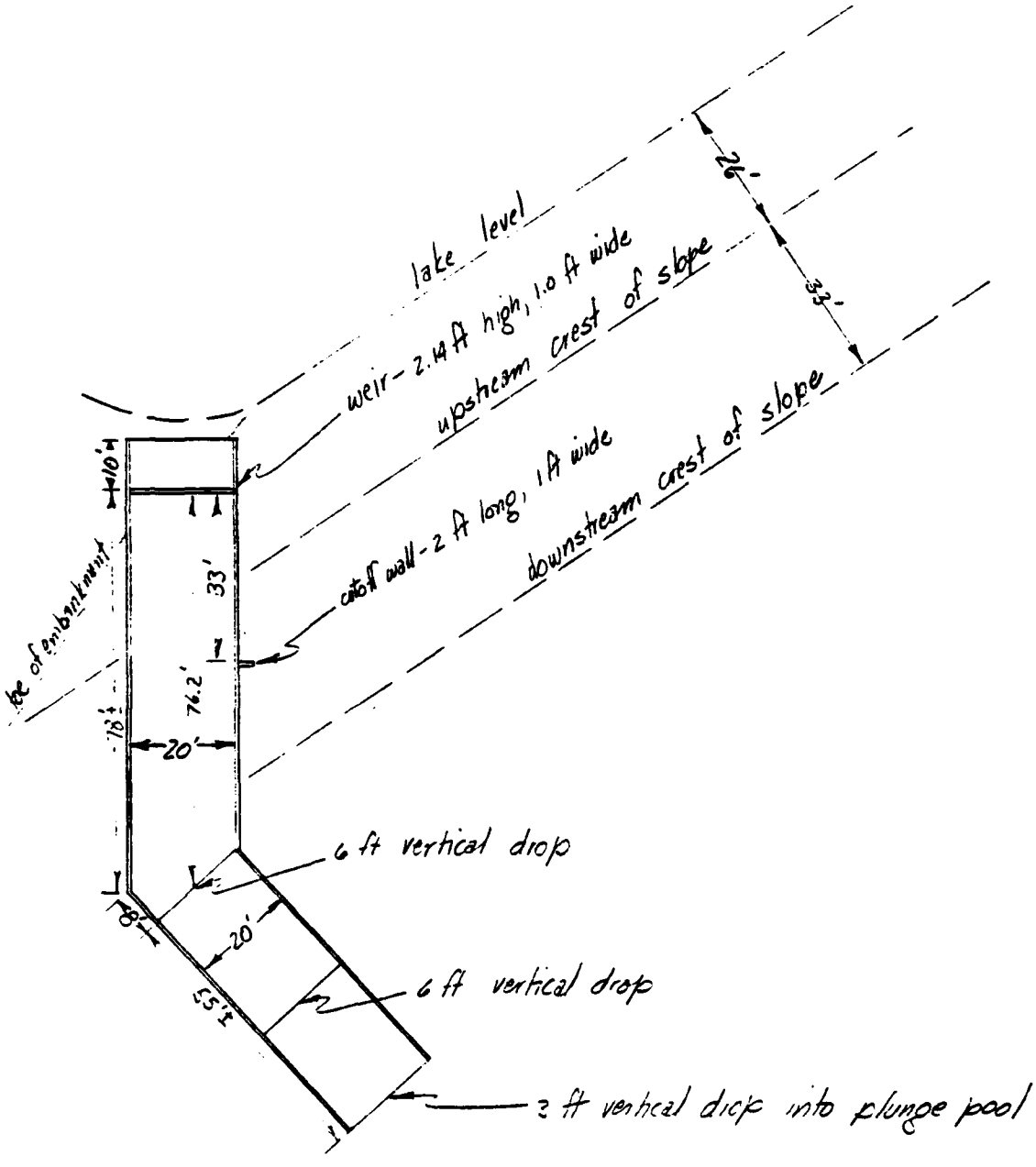
Box 280
Beaver, Pa. 15009

Subject Neal Dam - Emergency Spillway (not to scale) S.O. No. 13547-00-ARA-20
Sheet No. 8 of 9
Drawing No.
Computed by JAQ Checked by Date 12/6/79

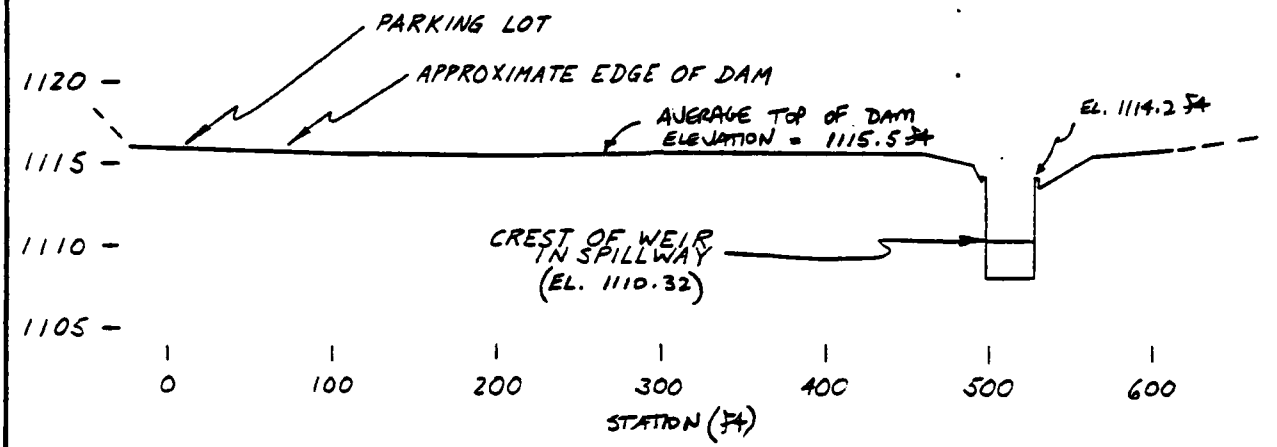


MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
Box 280
Beaver, Pa. 15009

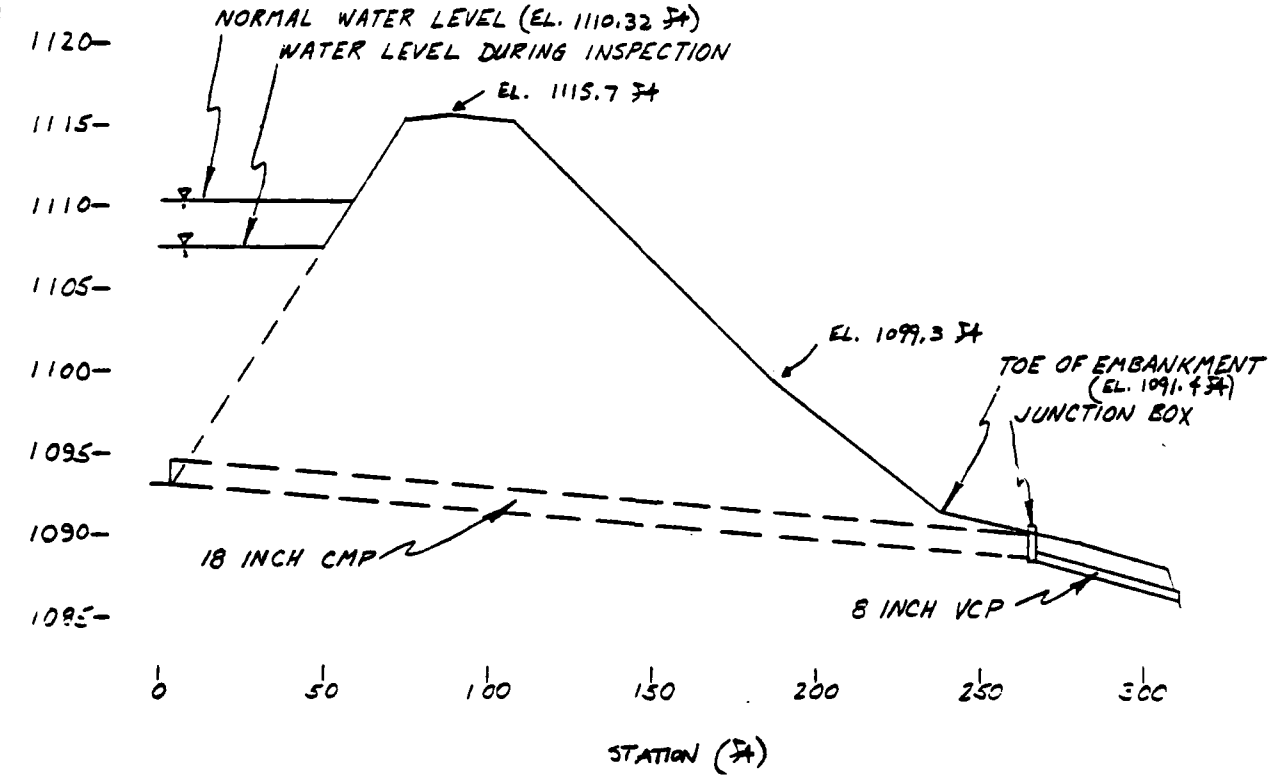
Subject NEAL DAM
DAM PROFILE AND
CROSS SECTION

S.O. No. 13547-00-ARA-20
Sheet No. 9 of 9
Drawing No.
Computed by JAQ Checked by Date DEC 7, 1979

TOP OF DAM PROFILE (LOOKING DOWNSTREAM):



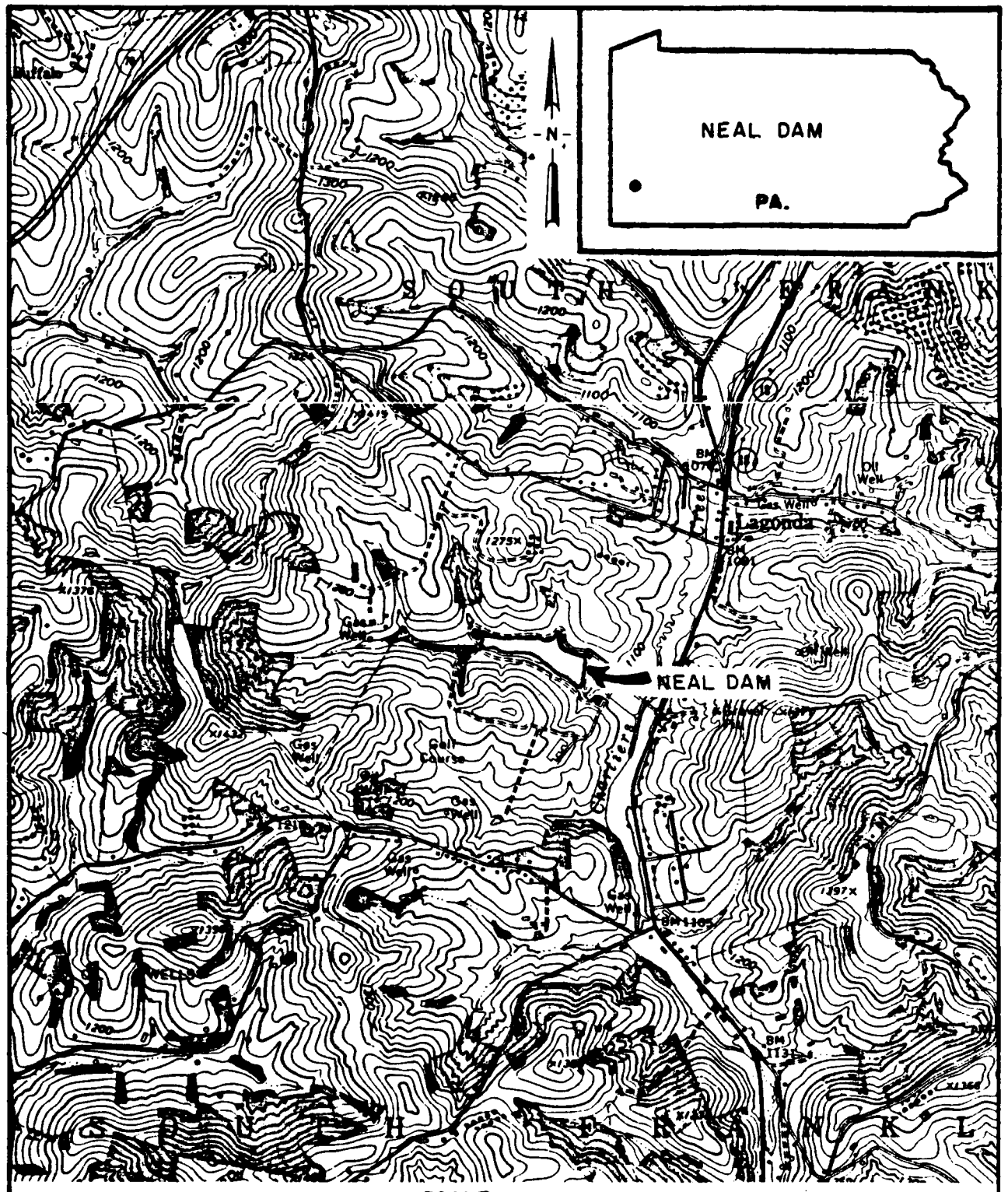
CROSS SECTION: (AT STATION 2+00)



APPENDIX E

PLATES

CONTENTS



SCALE 1:24000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

PLATE 1 LOCATION PLAN

NEAL DAM

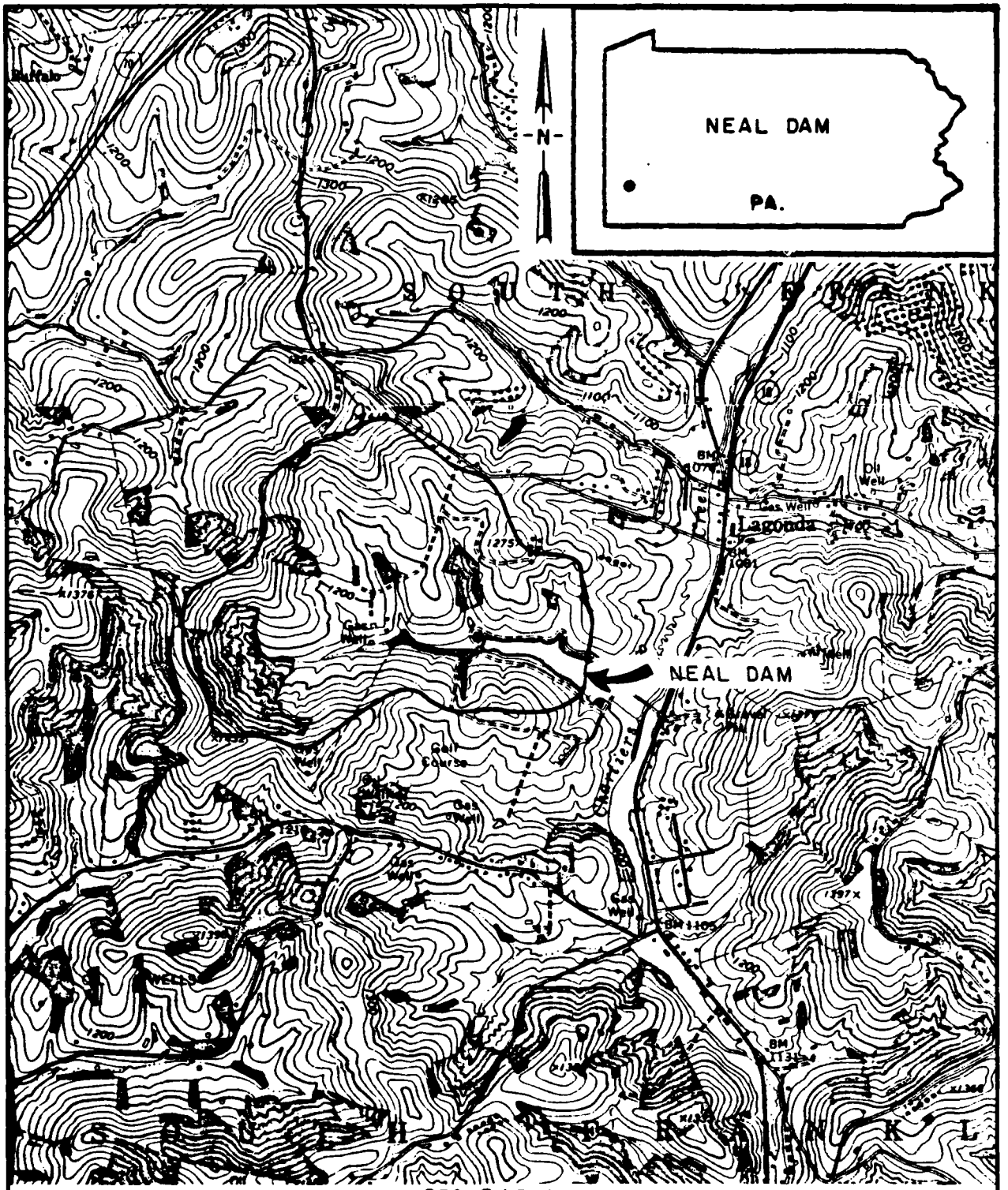
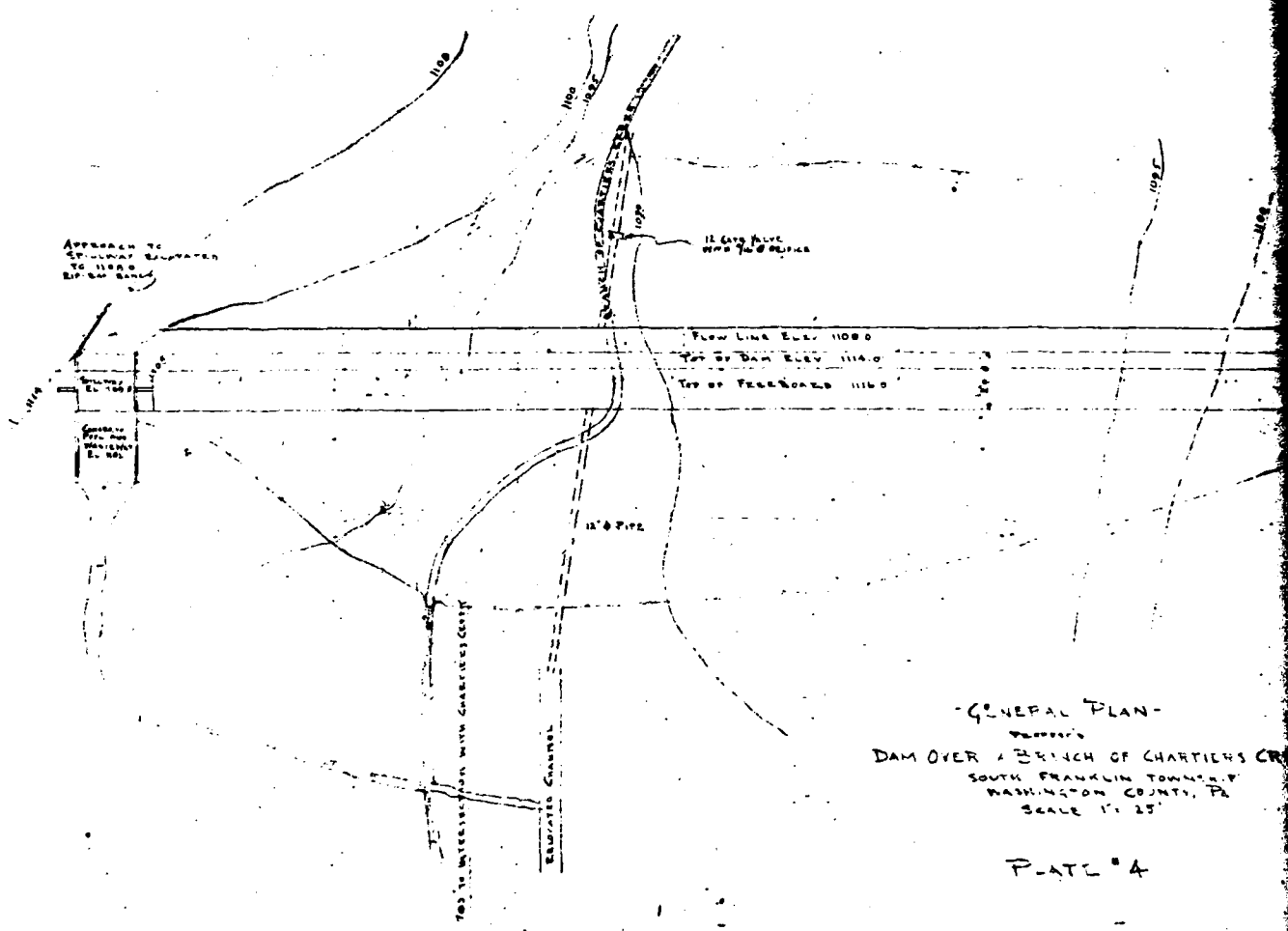


PLATE 2 WATERSHED MAP

NEAL DAM



-General Plan-

Proposed

Dam Over a Branch of Chartiers Cr.

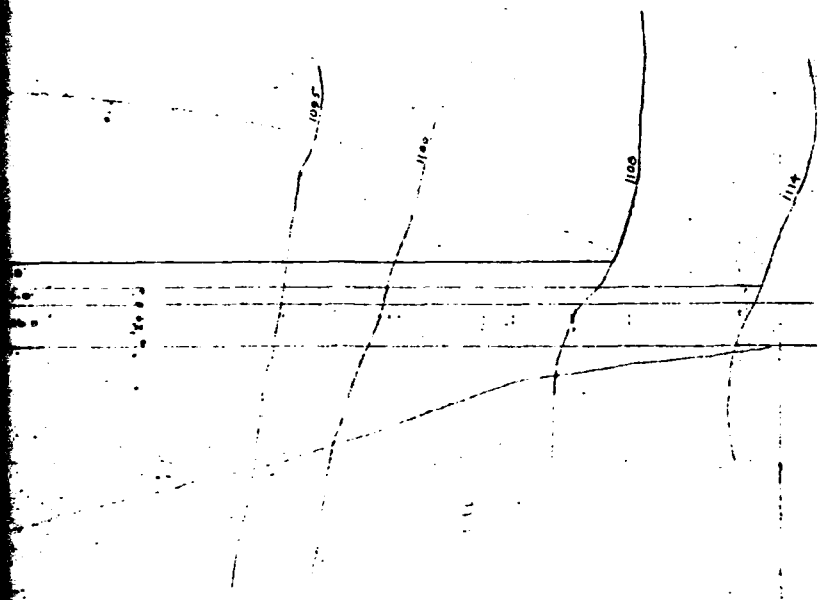
South Franklin Township

Washington County, Pa.

Scale 1" = 25'

Plate #4

2



-General Plan-

Dam Over a Branch of Chartiers Creek

South Franklin Township

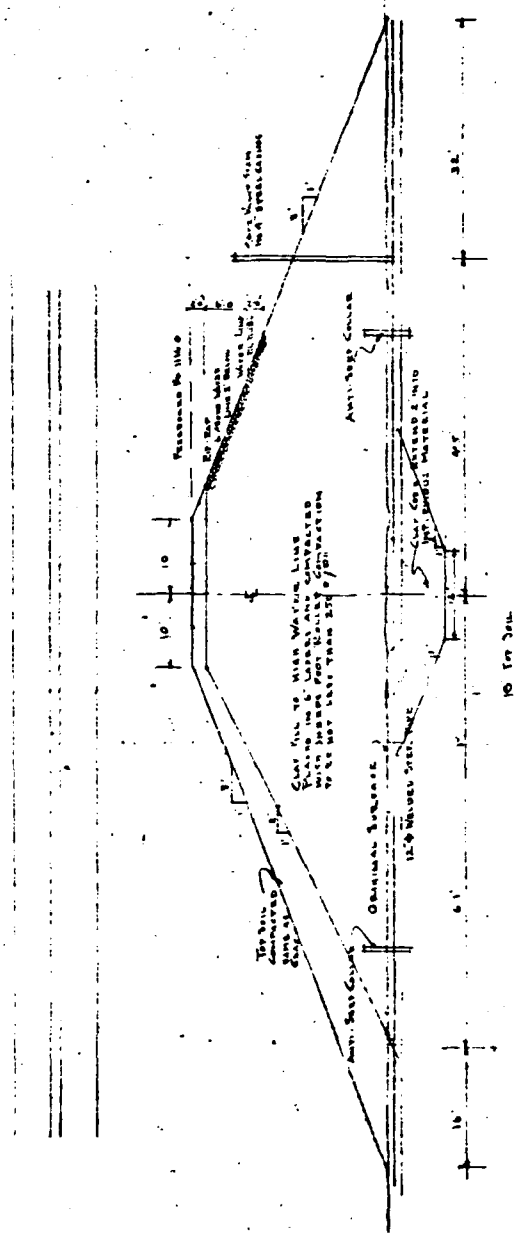
Washington County, Pa.

Scale 1" = 25'

Plate #4

Arthur E. Tennyson, R.A.
600 Washington Road
Pittsburgh 28, Pa.

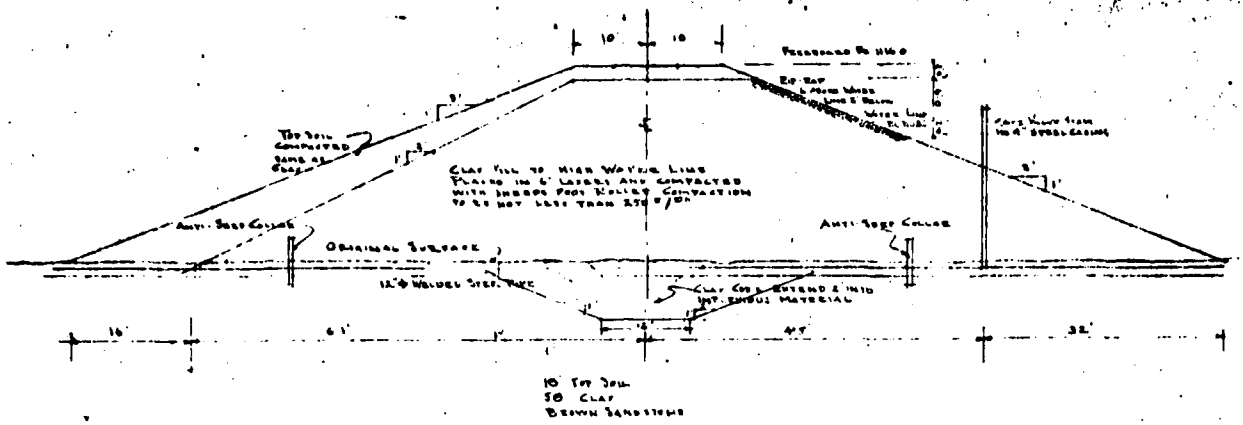
8/9/57
8/21/57
8/30/57



Cross Section

Proposed

Dam Over a Branch of Chartiers Creek



CROSS SECTION

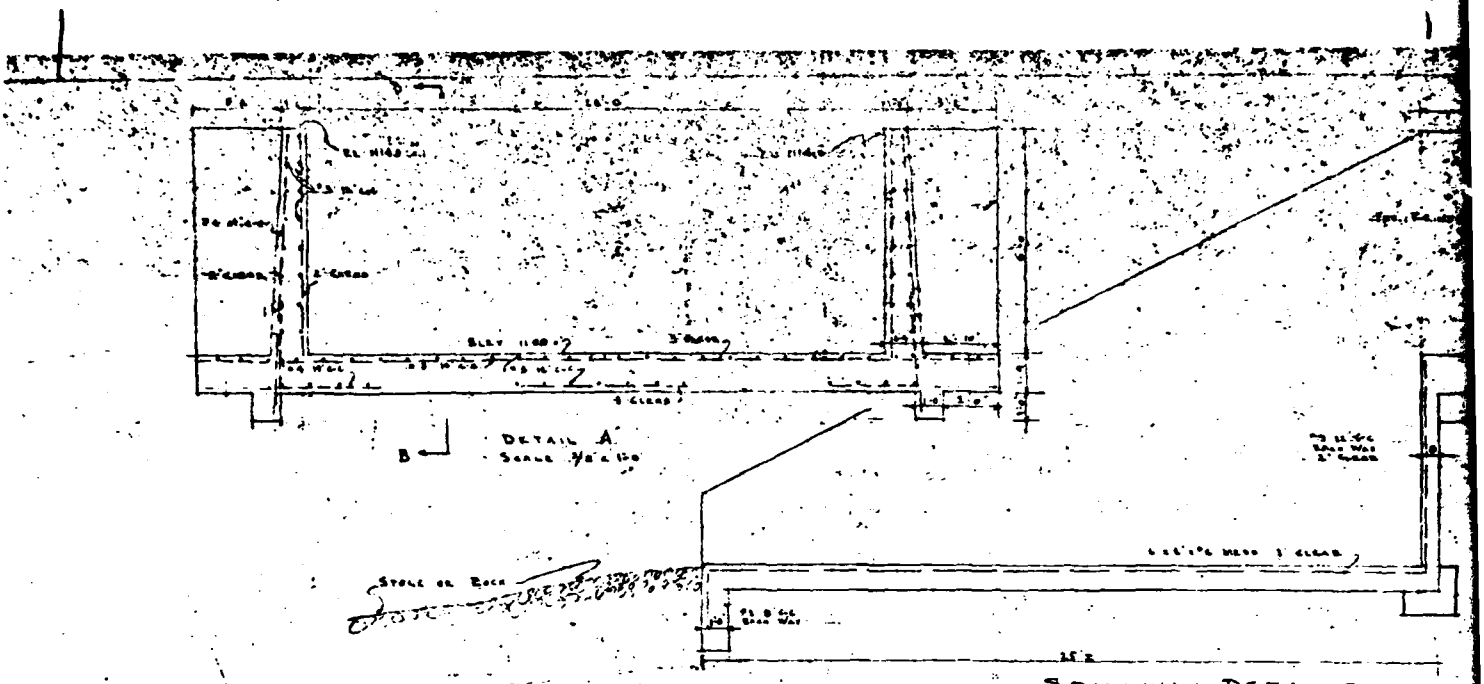
PROPOSED

DAM OVER A BRANCH OF CHARTIERS CREEK

SOUTH FRANKLIN TOWNSHIP
WASHINGTON COUNTY, PA.

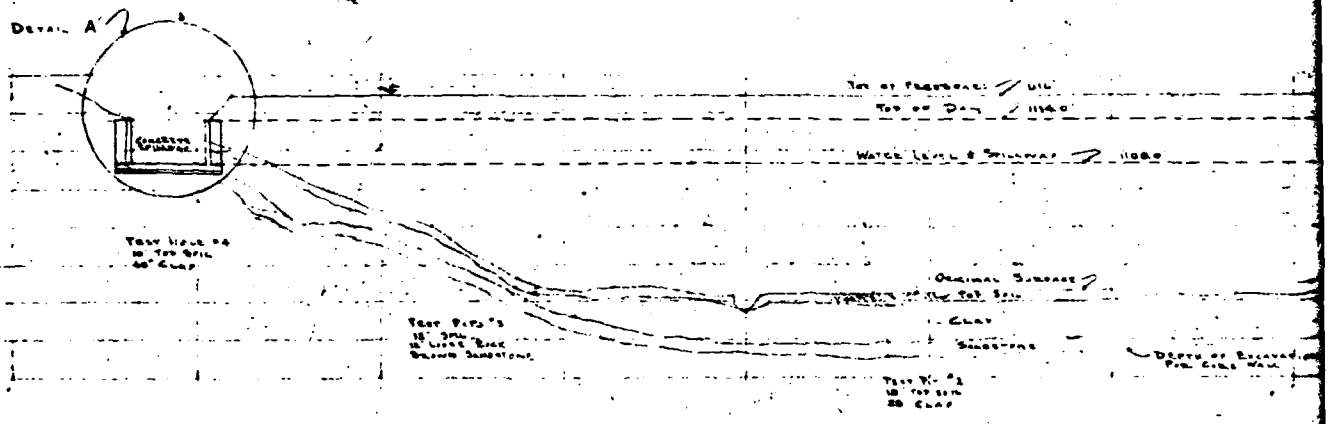
PLATE #5

PLATE 3



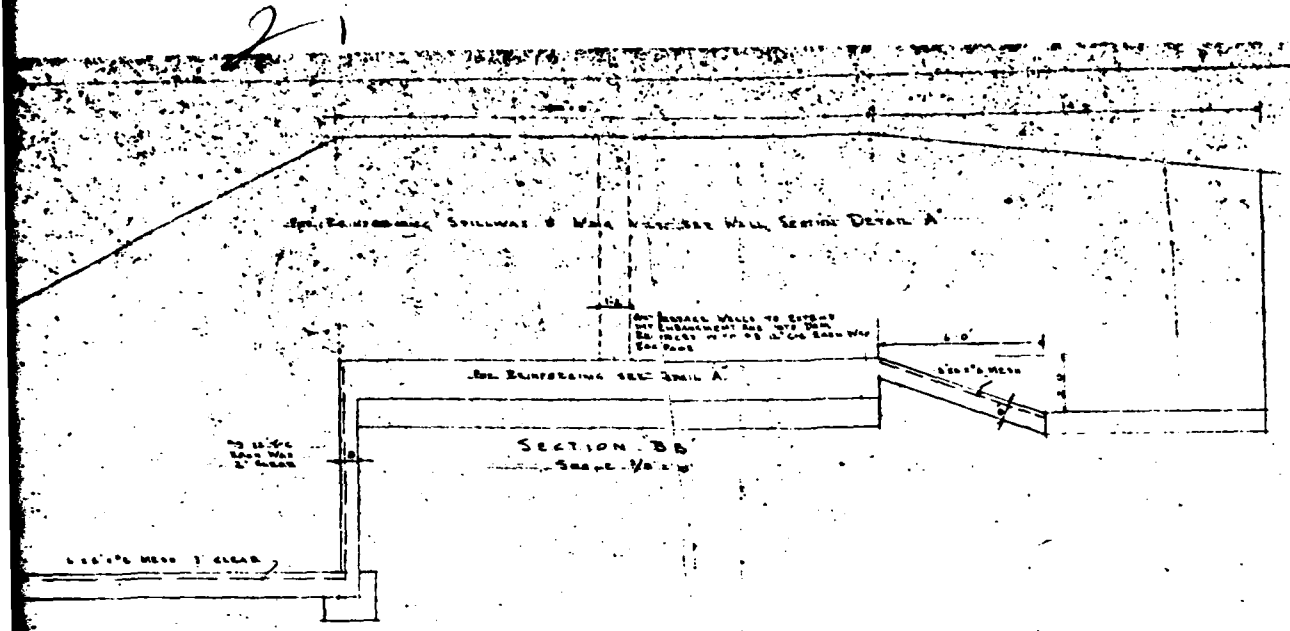
SPILLWAY DETAILS
PROPOSED
DAM OVER A BRANCH OF CHARTIERS CREEK
SOUTH FRANKLIN TOWNSHIP
WASHINGTON COUNTY, PA
SCALE AS NOTED

PLATE #6



LONGITUDENAL SECTION
PROPOSED
DAM OVER A BRANCH OF CHARTIERS CREEK
SOUTH FRANKLIN TOWNSHIP
WASHINGTON COUNTY, PA.
HORIZONTAL SCALE 1" = 50'
VERTICAL SCALE 1" = 10'

PLATE #3

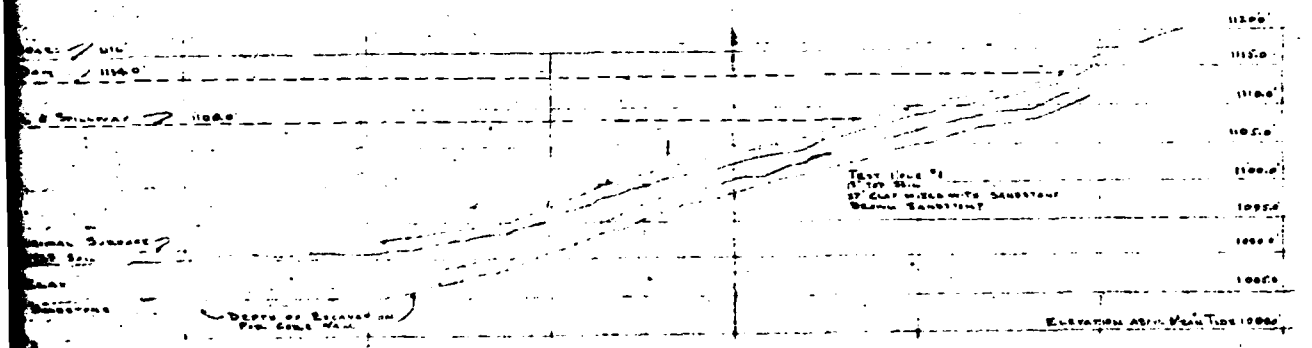


LOUIS W. REID

ARTHUR E. TENNYSON, R.A.
600 WASHINGTON ROAD
PITTSBURGH 28, PA.
8/9/57
8/21/57
8/30/57

LWAY DETAILS
PROPOSED
ANCH OF CHARTIERS CREEK
SOUTH FRANKLIN TOWNSHIP
SHINGTON COUNTY, PA.
SCALE AS NOTED

PLATE #6



ITUDENAL SECTION
PROPOSED
BRANCH OF CHARTIERS CREEK
SOUTH FRANKLIN TOWNSHIP
WASHINGTON COUNTY, PA.
HORIZONTAL SCALE 1"=50'
VERTICAL SCALE 1"=10'

PLATE #5

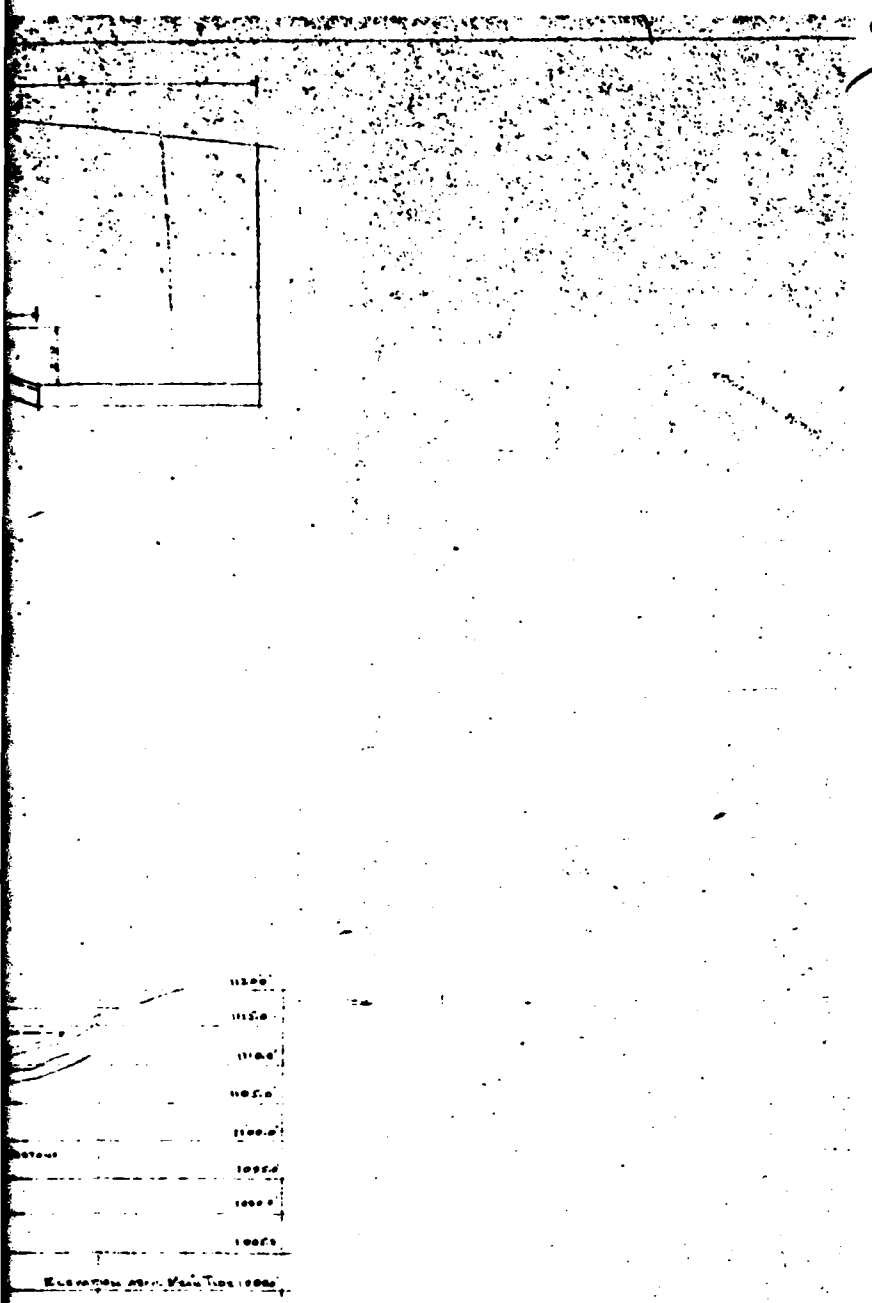
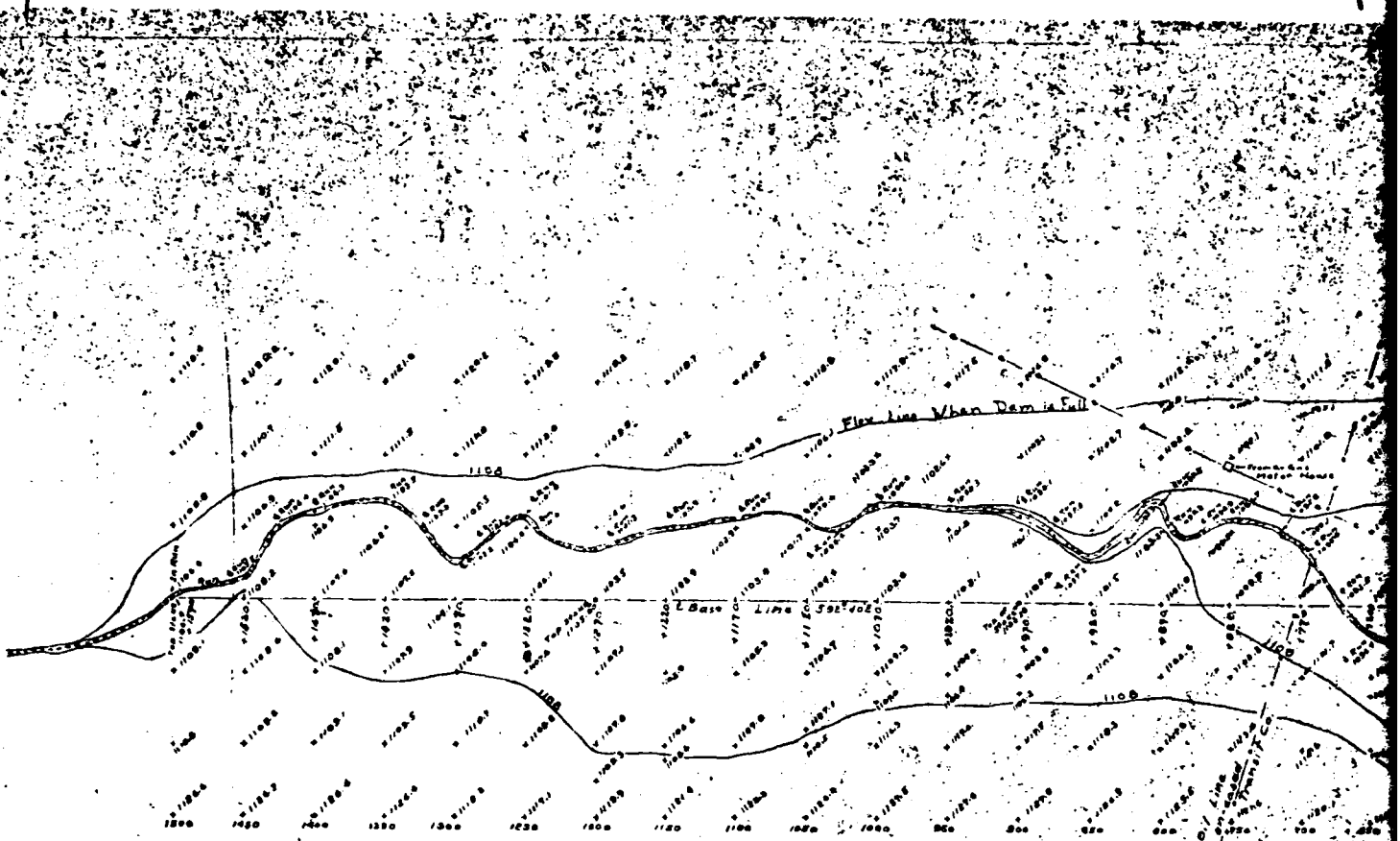
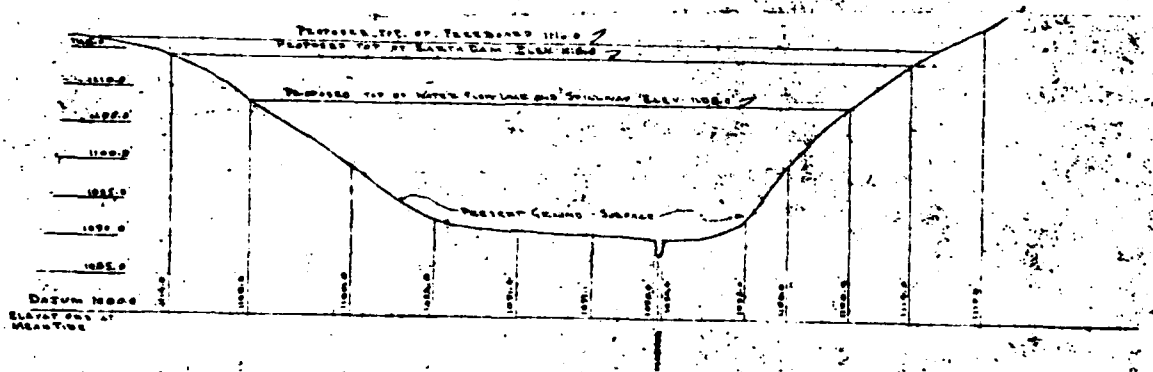


PLATE 4

LOUIS W. RETO

8/9/77
8/21/77
8/26/77

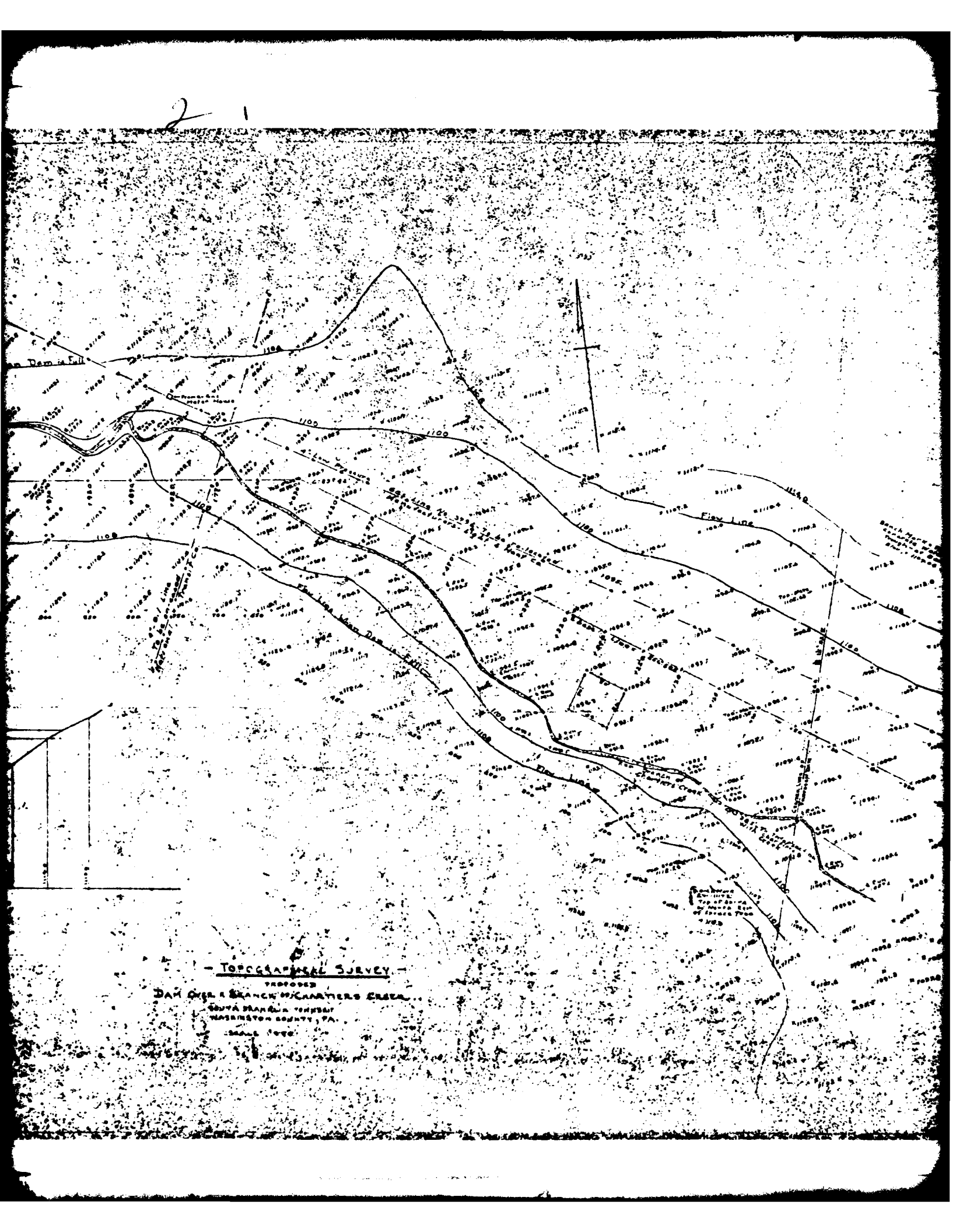




LONGITUDINAL SECTION ALONG CENTERLINE OF DAM
FROM UPSTREAM
SCALES: HORIZONTAL 1"=50'
VERTICAL 1"=10'

TOPOGR

DAM OVER K
SOUTH FORK
WASHINGTON



TOPOGRAPHICAL SURVEY

PROPOSED

DAM OVER E BRANCH OF CHARTIERS CREEK

SOUTH FRANKLIN TOWNSHIP

WASHINGTON COUNTY, PA.

SCALE 1"=100'

3

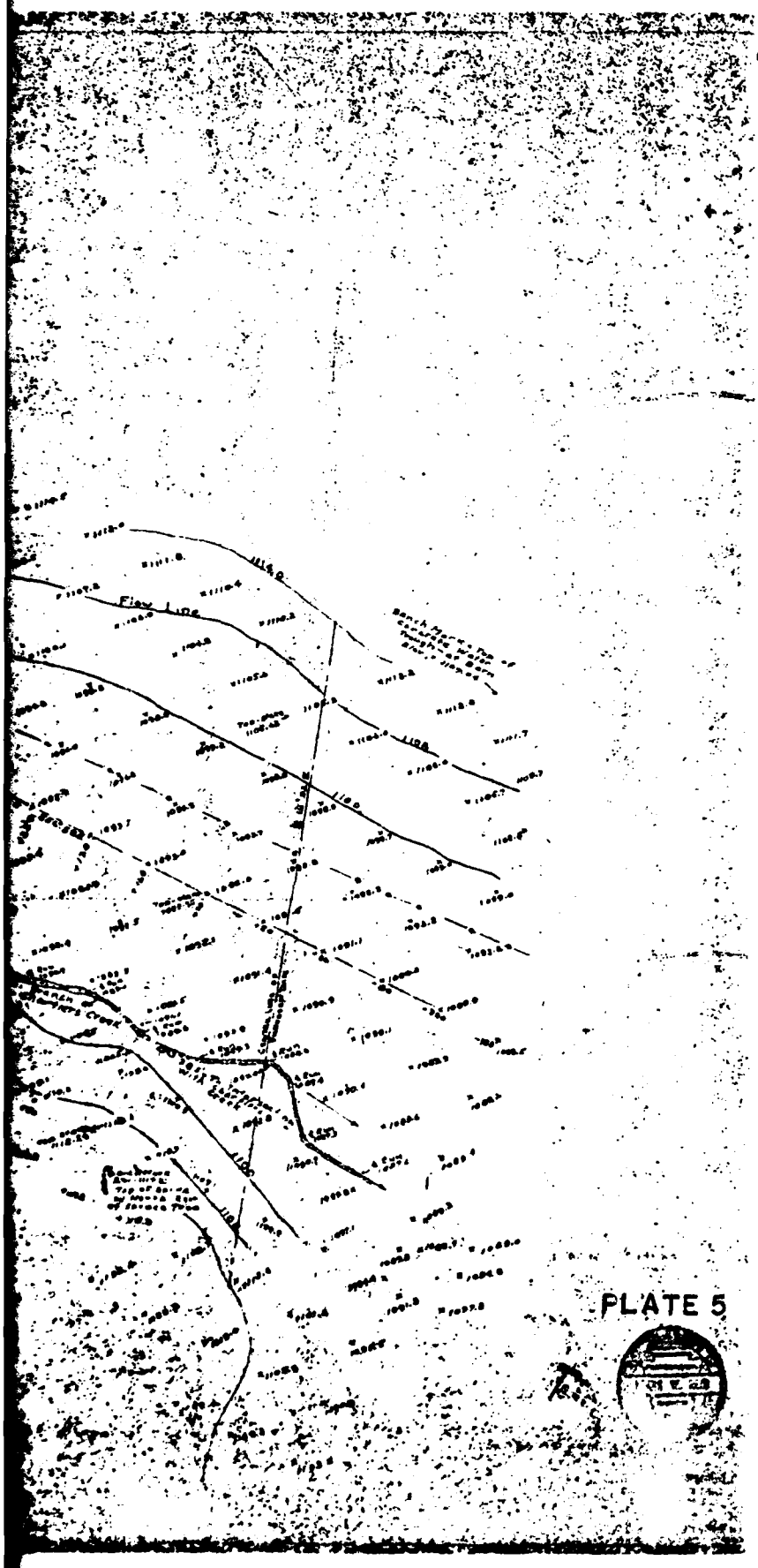


PLATE 5

APPENDIX F

REGIONAL GEOLOGY

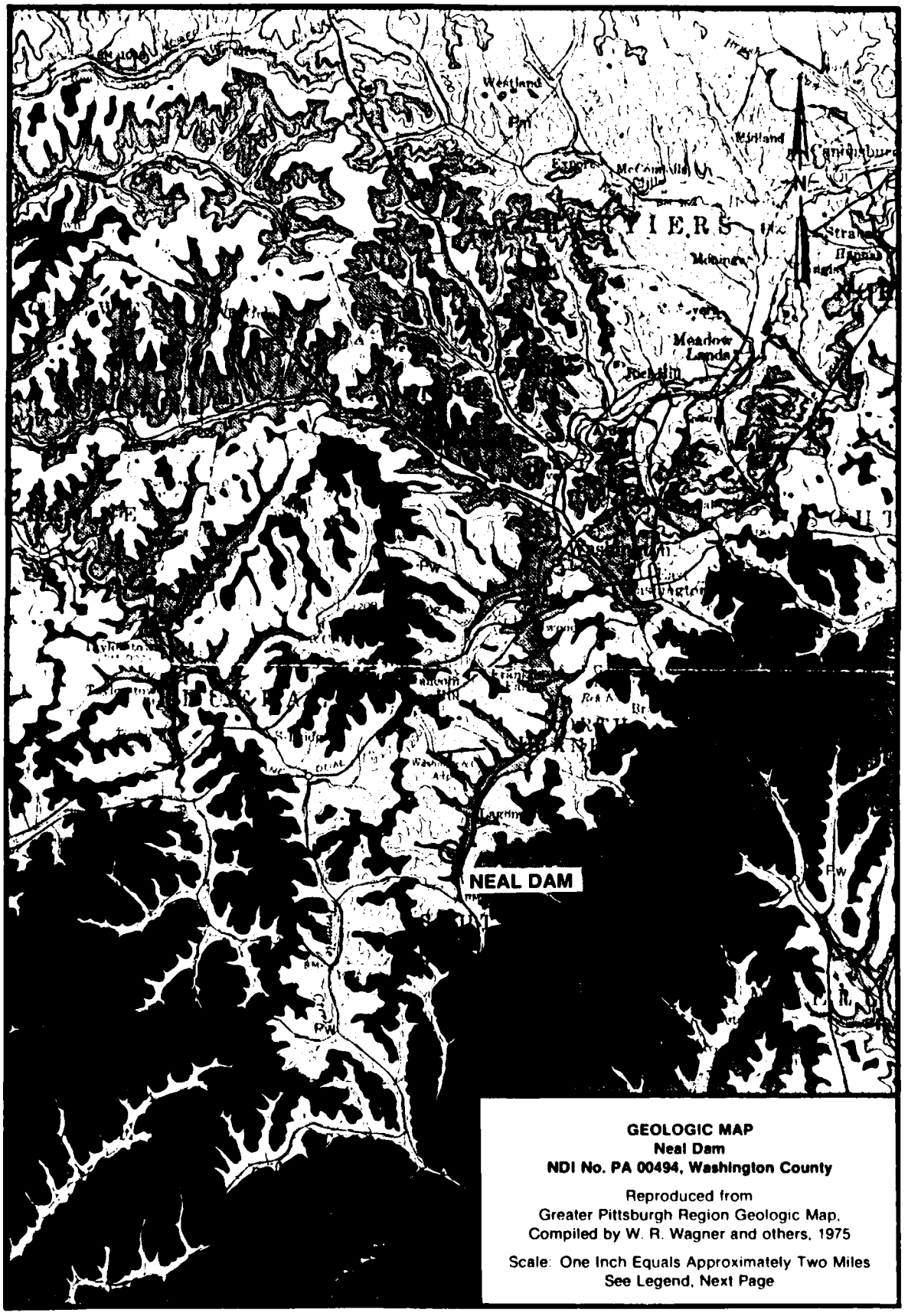
NEAL DAM
NDI No. PA 00494, PennDER No. 63-68

REGIONAL GEOLOGY

The dam and reservoir are located in an unglaciated area of the Appalachian Plateaus Physiographic Province. The dam is located approximately 0.4 mile east of the axis of the Washington Anticline. According to the structure contour map for the Pittsburgh coal, the bedrock units are dipping approximately 60 to 80 feet to the southeast. (Reference: "Greater Pittsburgh Region Structure Contour Map of Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland Counties," compiled by W. R. Wagner and others, 1975.) Bedrock units below the dam are part of the Waynesburg Formation, Dunkard Group, Pennsylvanian System. This formation consists of cyclic sequences of sandstone, shale, limestone, and coal. The Waynesburg Formation contains the Waynesburg coalbed at the base of the formation. This coalbed is the marker which separates the bottom of the Dunkard Group from the top of the Monongahela Group. The overlying Washington Formation is shown outcropping above the elevation of the top of dam along the valley hillsides.

Located approximately 450 feet below the top of dam elevation is the Pittsburgh coal. The Pittsburgh coal mineral rights below the dam are identified as being owned by Republic Steel Corporation (Reference: "Greater Pittsburgh Region Mined Out Areas of the Pittsburgh Coal" by S. E. Curtis and others, 1975). The thickness of the Pittsburgh coal has been shown to be approximately 68 inches for the lower bench, a 9 inch parting, and 60 inches for the upper bench. Other coals above the Pittsburgh coal include in ascending order 1) Sewickley coal (absent), 2) Uniontown coal (represented by carbonaceous shaly mudstone), 3) Waynesburg coal (approximately 28 inches thick - note that at this location the Waynesburg coal is partially eroded by post-Early Permian erosion), 4) Waynesburg "A" coal (36 inch thick bed with 12 inches of coal), and 5) Washington coal on hillsides above dam (60 inch bed with 12 inches of coal). (Reference: "Coal-Bearing Upper Pennsylvanian and Lower Permian Rocks, Washington Area, Pennsylvania," by Henry L. Berryhill, Jr., Stanley P. Schweinfurth, and Bion H. Kent, United States Geological Survey Professional Paper No. 621, 1971.)

According to information on the original design drawings, four test pits excavated along the axis of the dam indicated that the foundation below the dam consisted of 12 to 18 inches of topsoil overlying 12 to 60 inches of clay. Bedrock below the soil in all cases was designated as brown sandstone.



GEOLOGIC MAP
Neal Dam
NDI No. PA 00494, Washington County

Reproduced from
Greater Pittsburgh Region Geologic Map,
Compiled by W. R. Wagner and others, 1975

Scale: One Inch Equals Approximately Two Miles
See Legend, Next Page

GEOLOGY MAP LEGEND

GROUP	FORMATION		DESCRIPTION
	Alluvium	Qt	Sand, gravel, clay.
	Terrace deposits		Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation.
DUNKARD	Greene		Cyclic sequences of sandstone, shale, red beds, thin limestones and coals.
DUNKARD	Washington	Pw	Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base.
DUNKARD	Waynesburg	PPw	Cyclic sequences of sandstone, shale, limestone and coal; contains Waynesburg coal bed at base.
MONONGAHELA		Pm	Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base.
CONEMAUGH	Casselman	Pcc	Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.
CONEMAUGH	Ames		
CONEMAUGH	Glenshaw	Pcg	Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top.
ALLEGHENY	Vanport	Pa	Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.
ALLEGHENY	Vanport	Pa	
POTTSVILLE		Pp	Sandstone and shale; contains some conglomerate and locally mineable coal.
Mauch Chunk		Mmc	Red and green shale with some sandstone; contains Wymps Gap and Loyalhanna limestones.
Pocono		Mp	Sandstone and shale with Burgoon sandstone at top.


DAT
ILM